NAVAL POSTGRADUATE SCHOOL

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THESIS

EFFECTIVENESS EVALUATION OF FORCE PROTECTION TRAINING USING COMPUTER-BASED INSTRUCTION AND X3D SIMULATION

by

Wilfredo Cruzbaez

September 2007

Thesis Co-Advisors: Don Brutzman
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EFFECTIVENESS EVALUATION OF FORCE PROTECTION TRAINING USING COMPUTER-BASED INSTRUCTION AND X3D SIMULATION

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Submitted in partial fulfillment of the
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ABSTRACT

Due to growing operational constraints accelerated by the Global War on Terror, the United States Navy is looking for alternative methods of training to maintain its force in a high status of readiness. Updates in technology over the last decade have prompted Navy officials to take the initiative to update its training technologies. Computer-Based Instruction provides alternative means of training so that the training of war-fighters can be accomplished efficiently and effectively, saving the U.S. Navy time and resources while maintaining a high state of readiness. The goal of this thesis is to combine the principles of Instructional Design Systems (ISD) technology and advanced Simulation in order to produce a multimedia training capability for Navy and Marine Corps Officers.

   Specifically this thesis applies ISD principles to engineer and improve the Anti-Terrorism Force Protection (AT/FP) Officer Course Level II (ATO Level II Course) lessons for use by Navy and Marine Corps officers. The SavageStudio scenario generation application, originally designed for assessment of force protection measures in a port environment, is used to allow students to develop simulation lessons for this course.

The final product of this thesis is a training course consisting of two lessons combining Computer- Based Training and Simulation providing interactive lessons and exercises, and two media delivery comparison studies with results for the Anti-Terrorism Force Protection lessons. The first study compared media effectiveness of Computer-Based Training versus Classroom instruction. The second study assessed the effectiveness of Computer-Based Training and the use of simulation for AT/FP.

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ACRONYMS AND ABBREVIATIONS

ADDIE	Analysis Design Development Implementation Evaluation
APA	American Psychological Association
AT/FP	Anti-Terrorism / Force Protection
ATO	Anti-Terrorism Officer
C2	Command and Control
CBI	Classroom-Based Instruction
CBT	Computer-Based Training
CI	Classroom Instruction
CVN	Aircraft Carrier, Nuclear
COA	Course of Action
DIS	IEEE Distributed Interactive Simulation Protocol
DES	Discrete Event Simulation
DoD	Department of Defense
DOE	Design of Experiments
ELV	Explosive-Laden Vessel
ESPDU	Entity State Protocol Data Unit
FPCON	Force Protection Condition
FPO	Force Protection Officer
GUI	Graphical User Interface
GMT	General Military Training
GWOT	Global War on Terrorism

HVA	High-Value Asset
HVU	High-Value Unit
IED	Improvised Explosive Device
ISD	Instructional Systems Design
ISP	In-port Security Plan
IT-21	IT for the 21st Century
MOE	Measure of Effectiveness
MOP	Measure of Performance
MOVES	Modeling Virtual Environments and Simulation
M&S	Modeling and Simulation
NKO	Navy Knowledge Online
NMCI	Navy and Marine Corps Intranet
NPS	Naval Postgraduate School
PCL	Property Change Listener
PQS	Personnel Qualification Standards
RHIB	Rigid Hull Inflatable Boat
SAVAGE	Scenario Authoring and Visualization for Advanced Graphical Environments
SBT	Simulation-Based Training
SMAL	Savage Modeling Analysis Language
SME	Subject Matter Expert
SSDF	Ship's Self-Defense Force
TAD	Temporary Additional Duty

WBI   Web-Based Instruction

X3D   Extensible 3D Graphics Standard

XML   Extensible Markup Language

VBSS   Visit Board Search and Seizure

2D   Two Dimensional

3D   Three Dimensional

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I. INTRODUCTION

A. PROBLEM STATEMENT

The United States has been under terrorist threat and attack since the early 1980's by ideological, political and religious groups that do not agree with United States policies and objectives around the world. According to sources from the Center for Security Forces (CENSEFOR 2006), the U.S. military has suffered more casualties due to terrorism than in combat operations during the period since the Beirut bombing attack in 1983 to the beginning of Operation Iraqi Freedom. Terrorist groups recognize that the strength of the United States Armed Forces is unparalleled and therefore, it is impractical for these groups to challenge the U.S. military directly. Instead terrorist groups choose to attack vulnerabilities of U.S. forces in order to gain psychological, ideological and political support.

Events such as the USS COLE attack on 12 October 2000, while refueling in Yemen, and the attempted missile attack on the USS ASHLAND and USS KEARSARGE, while moored in port in Jordan on 19 August 2005, reflect the Navy's need for effective Force Protection employment of assets and Anti-Terrorism personnel training. It is in the Navy's best interest that all hands be properly trained on Anti-Terrorism Force Protection (AT/FP) tactics techniques and procedures (TTP) to deter, defend, detect and mitigate against future attacks.

While classroom instruction continues to be the most preferred delivery method of instruction, there has been a significant increase in technology usage over the past twenty years that enables other delivery methods of instruction. Classroom instruction is a cost-effective tool for small organizations but it can impose several constraints for large organizations such as time, cost and travel. While face-to-face training supports interaction and immediate feedback, learning can be achieved in other settings where the end user is not limited by time or location. Users can access the instructional lecture material whenever it meets their needs.

1

A large organization such as the United States Navy has its personnel deployed at locations all over the world, accomplishing a variety of different missions. Training costs are expensive. There are costs to maintain the classroom facilities, to pay the instructors, to maintain the teaching materials and aids, to provide travel and lodging for the sailors, and to make up for the work hours lost due to the sailors being away from work. Properly designed Computer-based Training (CBT), can address these man issues.

B.   BACKGROUND TRAINING METHODOLOGIES

As a result of the Quadrennial Defense Review of 1997, the Department of Defense initiated the Advanced Distributed Learning (ADL) effort. The intent is to set forth a framework to provide DoD personnel the ability to achieve high quality education and training tailored to individual needs, and also to deliver cost effectively whenever and wherever is required (Executive Review of Navy Training Final Report, 2001). In 2001 the Executive Review Board of Naval Training concluded that traditional classroom instruction was inefficient relative to cost and total time to train each student (Executive Review of Navy Training Final Report, 2001). The U.S. Navy commenced a review of its instructional methodology and implemented several new programs.

One such new program was implemented at the Naval Air Technical Training Center in Pensacola Florida and the Submarine Learning Center in Groton, Connecticut. The Apprentice Technical Training Program for Electronic Technical Training was created under the Naval Personnel Development Center (NPDC). Its purpose was to review and assess the electronic technician training curricula. Extensive reviews of the electronic training program were conducted by Subject Matter Experts (SME) as requested by the Nida Corporation, which was contracted to restructure, standardize and manage the implementation of the computer-based learning environment for the electronic oriented enlisted rates. The computer-based learning environment allowed students to proceed from basic training to the basic electronic school without having to wait for the class to be full enough to commence a new class. This allowed for the school administrators to schedule more classes, more often with fewer students. Students proceeded with lessons at their own pace and graduated ahead of their peers when

compared with the prior classes. Scenario-based testing was conducted and students demonstrated retention of proficiency levels in measuring, analyzing, and troubleshooting an array of previously studied circuits (Gulliver 2001). The Naval Training Facility located in Pensacola Florida was closed in 2004 during Hurricane Ivan but students were able to access the courses from Great Lakes without having to wait for the installation to fully restore all its classroom facility services.

Another relevant Computer-Based Training (CBT) / Web-Based Trainer (WBT) training program was implemented in 2004 by John Ruffner, Kathleen Titley and Jim Fullbrook titled, *Integrating Technologies for Shipboard Helicopter Signaling Skill Training*. A prototype CBT/WBT of the Landing Signal Enlisted (LSE) course created by the DCS Corporation Orlando, Florida was tested at the LSE School located in Naval Air Station (NAS) Norfolk. System developers and Subject Matter Experts (SMEs) reviewed current training curricula and Personnel Qualification Standards (PQS) to develop the course structure. The final product was created using the schoolhouse curriculum which matched more precisely the objectives of the instruction. Instructors at the LSE School expressed strong support for the resulting CBT. They commented that they planned to use the CBT course as a teaching aid to supplement classroom instruction and discussion as well as using it as a "study ahead" tool. The developers are working to formally evaluate and validate the CBT/WBT and also are working on a virtual-reality simulator, so that it can be included in the LSE schoolhouse curriculum (Ruffner, Titley and Fullbrook, 2004).

Updates in technology over the last decade have prompted the Chief of Naval Operations (CNO) to take the initiative to update training technologies for the United States Navy, as seen by various new technologies adopted for the training of naval forces. Of particular note is that the survival of our sailors depends on their ability to be properly trained on Anti-Terrorism Force Protection (AT/FP) use and employment of assets to deter, defend, detect and mitigate against future attacks. The creation of an AT/FP CBT with embedded simulation can improve training in such procedures. Research conducted by Sitmann, Kraiger, Stewart and Wisher (2006) and Hastings and Tracey (2005) points out the benefits of Computer-Based Training in comparison compared to other more

traditional methods of instruction. CBT and simulations can be effective and efficient, increasing learning and knowledge transfer without the constraints of classroom instruction. The benefits of a training program that can be accessed in any place at any time gives the sailors the ability to grow professionally and military.

C.   OVERVIEW

The United States Navy has been looking at new technologies to provide training to its sailors. The evolution of computers and web applications over the last two decades has allowed the Navy to migrate to some degree prior classroom instruction into Web-based Instruction and Web-based portals such as Navy Knowledge Online (NKO). These new technologies offer some advantages that are necessary in today's tempo of operations. Currently there are many Navy courses that can be restructured to allow for the delivery of the material using this Computer and Simulation-based technologies.

> The Mission of the Naval Education and Training Command (NETC) is to ensure fleet readiness and mission accomplishment, enhance professional and personal growth, and enable life-long learning. Guiding principles include: educate and train fleet requirements, provide the tools, learning and guidance that enable sailors to develop to their fullest potential, professionally and personally, provide responsive, best value solutions through rigorous analysis and disciplined, prioritized alignment with fleets, measure the success by the success of each sailor and the fleet, encourage innovation and personal initiative….. (NETC 2007).

As operational tempo increases based on the demands imposed by the Global War on Terror (GWOT), the United States Navy needs to continue investigating and applying technologies that allow sailors to be trained to their fullest potential with minimum impact to the Navy's mission.

D.   MOTIVATION

As a former Training Officer, this author has experienced first hand the rigorous training demands imposed on afloat and ashore commands from the increased operational tempo of the GWOT. Commands are required to achieve and maintain higher levels of readiness in all warfare areas; however the operational day remains twenty four hours long, with the same number of sailors and command budgets steadily decreasing.

In today's Navy sailors no longer specialize in a single area. They must be trained to master multiple warfare areas such as Damage Control (DC), Visit Board Search and Seizure (VBSS) and Force Protection (AT/FP) in addition to their primary in-rate duties.

It has been difficult for commands to decide when to allow sailors time away from the command to attend courses in a classroom setting, because the sailor may be needed for other ship operations allowing the sailor to be absent may decrease the command's state of readiness. Decreasing budgets are also a factor when making these decisions because the command may not have the funds needed to send all sailors's on Temporary Additional Duty (TAD) to a school for the required training.

Computer-based Training (CBT) and Simulation-based Training (SBT) are underutilized technologies that can help in the training field. Modeling and Simulation technologies can be used to create Scenarios that exercise the individual and group learning skills. There have been previous attempts to use CBT and SBT to train sailors onboard ships. Some have been somewhat successful, such as Division Officer Training at Sea from the Surface Warfare Officer School (SWOS), Newport Rhode Island. Other training attempts have been less successful, such as the Navy's General Military Training (GMT). Often the less-than-successful results are not due to the technology used to deliver the instruction, rather the way that the courses are organized and developed. If the material and content of a course is poorly developed, instruction results will be poor no matter what technology is used. The Instructional System Design (ISD) approach can be used to create, implement and evaluate course materials that can be later paired to the available technologies to achieve maximum knowledge gains.

E.   OBJECTIVES

The objective of this thesis research is to develop and test a prototype instruction system to teach Navy, Marine Corps Officers and Senior Enlisted in AT/FP using the Instructional Systems Design (ISD) approach. The thesis tasks that need to be accomplished in order to meet this thesis purpose are:

1. Conduct a study into the Anti-Terrorism Officer (ATO) Level II course to analyze what training objectives are achievable, based on the material that needs to be taught and the learner's current capabilities.

2. Conduct a task analysis based on cognitive and skill tasks needed to define the learning objectives for the training material, based on the information gathered from SME's and current course notes.

3. Develop a training delivery format, instructional methods and course content organization.

4. Review and evaluate different media technologies that allow the delivery of the course content, taking into consideration time, resources, budget constraints and course-learning goals.

5. Conduct experiments that focus on determining the most effective training strategy.

6. Report results and recommendations to Navy training commands in order to encourage further development and deployment of these important new tactical decision aids and technologies.

F.   THESIS ORGANIZATION

The thesis is organized as follows. Chapter II reviews background technologies, the Instructional System Design and previous work that motivated this thesis. Chapter III provides and in-depth look at the Analysis, Design and Development phases for the creation of the CBT lessons. Chapter IV provides a detailed explanation of the methodology used in the implementation phase of the thesis project. Chapter V outlines a step-by-step instruction on how to use SavageStudio in the creation of a Force Protection Simulation Scenario. Chapter VI results of the two studies conducted are discussed in great detail. Chapter VII provides a summary of the conclusions from this work and provides recommendations for future work. Appendix A contains the task analysis for lesson development. Appendix contains lesson enabling objectives. Appendix C contains media selection criteria. Appendix D and Appendix E contain lesson storyboards.

Appendix F thru Appendix I contain lesson pre and post-tests. Appendix J contains sample port brief information sheet. Appendix K contain Institution Review Board (IRB) forms sample. Appendix L contains the student questionnaire. Appendix M contains the SavageStudio exercise task checklist. Appendix N contains an Analyst report sample. Appendix O contains supporting materials and information on how to request SavageStudio and AT/FP lesson DVDs.

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II. RELATED WORK

A. INTRODUCTION

This chapter reviews prior Naval Postgraduate School (NPS) theses that served to motivate this thesis work. It also discusses the Anti-Terrorism Officer Level II course (ATO Level II course), the Scenario Authoring and Visualization for Advanced Graphical Environments (Savage) Studio simulation environment, and the Instructional Systems Design (ISD) concept used in the completion of this thesis. Relevant research about training effectiveness between Computer-Based Training (CBT) and Classroom Instruction (CI) is also discussed. Additional information on the topics related to this thesis can be found in the references section at the conclusion of this thesis.

B. ANTI-TERRORISM OFFICER LEVEL II COURSE (ATO LEVEL II COURSE)

The purpose of the Anti-Terrorism Officer (ATO) course is to incorporate the Level II mandated training requirements contained in DODINST 2000.16 to provide the ATO with the necessary skills and knowledge of the six elements of the AT program: Planning, Risk Management, Training, Exercises, Resources and AT Program Review. Graduates are qualified to manage their command's anti-terrorism program ashore and afloat (CENSECFOR 2006). Lesson topics include the concept of defense in depth, development of pre-planned responses, duties and responsibilities of an ATO, use of force, introduction to terrorism and terrorism operations, AT resources and tools, tactic techniques and procedures (TTP) and AT plan development and procedures (CENSECFOR 2006). Training is accomplished through a combination of classroom lectures and practical scenarios relevant to both shore-based and afloat commands.

The scope of the course is to train Navy commissioned officers and selected enlisted E-7 and above, USMC personnel and DoD equivalent civilians as Anti-Terrorism Officers (ATO). The course provides instruction in the U.S. Navy and Marine Corps Anti-Terrorism and Force Protection (AT/FP) programs as described in OPNAVINST 3300.55, MCO 3302.1C and DODINST 2000.16 (CENSECFOR 2006).

Course material includes the process for developing of comprehensive anti-terrorism plans, AT program management and AT program assessments and execution. The ATO Level II course is organized by classroom instruction followed by a practical scenario development. The course consists of five days of instructor led course instruction. The instructor uses presentation slides, class discussion and an assortment of visual aids during the initial three days of the course.

Topics covered in the ATO Level II Training Course are presented in Figure 1.

Unit 1

1-1-1 **-** Introduction

1-2-1 **-** Introduction to Terrorism/Terrorist Operations

1-3-1 **-** Introduction to Terrorism Program

1-4-1 – (FOUO) Improvised Explosive Devices (IED's)

1-5-1 **-** Use of Force/Deadly Force

1-6-1 – Anti-terrorism Officer Information and Tools

Unit 2

2-1-1 **-** Defense in Depth/Preplanned Responses

2-1-2 **-** Pre-Planned Responses

2-2-1 **-** Force Protection Conditions (FPCON's)

2-3-1 **-** Surveillance

2-4-1 **-** Individual Protective Measures

Unit 3

3-1-1 – Anti-terrorism Risk Management

3-2-1 – Anti-terrorism Threat Assessment and Threat Levels

Unit 4

4-1-1 **-** Introduction to Anti-terrorism Plans

4-1-2 **-** Sample In-port Security Plan

4-2-1 – Anti-terrorism Planning Process

4-3-1 – Anti-terrorism Plan Format

4-3-2 **-** JAT Guide Anti-terrorism Plan Basic Plan

4-4-1 – AT Program Funding

4-5-1 **-** USS Cole Case Study

4-6-1 **-** Khobar Towers Case Study

4-7-1 **-** Task One - Force Protection Conditions Exercises

4-7-2 **-** Post Orders for Main Gate and Industrial

4-8-1 – In-port Security Plan (ISP) Practical Application

4-9-1 **-** Ashore Table Top Exercise Brief

4-9-2 **-** Afloat Table Top Exercise Brief

Figure 1.   The ATO Level II Training Course Outline includes a variety of AT/FP
topics.

On the fourth day students are divided into teams to develop a force-protection
plan for a given scenario. On the fifth day the student-prepared plans are presented by
each team leader. Feedback is provided by the instructors and other students.

C.   RELEVANT NAVAL POSTGRADUATE SCHOOL THESES

LT. James Harney's thesis, *Analyzing Anti-Terrorist Tactical Effectiveness of
Picket Boats for Force Protection of Navy Ships Using X3D Graphics and Agent Based
Simulation* (March 2003) describes the use of open source, web, modeling and simulation
technologies used in the development of a prototype to aid tactical operators in the Anti-
Terrorism and Force Protection planning. The prototype allows for the operator to create,

visualize and analyze Anti-Terrorism and Force Protection "what-if" scenarios. The operators use these hypothetical scenarios to aid in the development of an effective Force Protection plan.

LT Patrick Sullivan's thesis, *Evaluating the Effectiveness of Waterside Security Alternatives for Force Protection of Navy Ships and Installations Using X3D Graphics and Agen-Based Simulation* (September 2006) expands LT Harney's thesis to include other force protection measures for Navy ships and installations. The prototype created by LT Harney was refined during LT Sullivan's thesis to provide Naval Installation Security Planners, Harbor Operations Support Staff and shipboard Force Protection Officers the ability to evaluate security alternatives using simulations. Furthermore the Scenario Authoring and Visualization for Advanced Graphical Environments (SavageStudio) scenario tool provides Naval Installation Security Planners with the ability to model, simulate and analyze new systems being considered in order to assess overall risk reduction and return on investment.

D.   SCENARIO AUTHORING AND VISUALIZATION FOR ADVANCED GRAPHICAL ENVIRONMENTS (SAVAGE) STUDIO

SavageStudio is a scenario-generation analysis and visualization tool that provides the user with the ability to create complete AT/FP simulations with minimal setup and design (Sullivan 2006). SavageStudio allows users to fully generate scenarios that can be played back and analyzed using discrete event simulation (DES) and Extensible 3D (X3D) graphics. The scenario generation is accomplished by leveraging the extensible markup language (XML) architecture of the Savage, X3D model archive and Viskit discrete event simulation to generate complex simulations for visualization and analysis.

The SavageStudio scenario generation tool provides the user with scenario creation capabilities using the same type of drag-and-drop interfaces used in most Navy Information Technology for the 21st century (IT-21) applications. The interface allows users to select models (locations, friendly assets, hostile assets, neutral assets, etc) that will be used in the scenario. During scenario configuration, the user can change physical

parameter values (maximum speed, cruising speed, vessel draft, range, altitude, etc.) for each model and define their behaviors (friendly patrol craft, hostile explosive-laden vessel, etc). Once the models and their behaviors have been selected and assigned, SavageStudio creates a Viskit assembly file and an X3D model of the scenario which corresponds to the assembly file.

Viskit is a visual programming tool for modeling behaviors and tactics that allows designers to use the Event Graph (EG) methodology to represent processes and mathematical equations as discrete event models (DES). A sample event graph is provided in Figure 2. Assembling multiple event graphs into a single simulation allows the user to construct tactical scenarios of intent and derive numerical analysis from their results. In DES the simulation time clock advances as events occur rather than running in constant blocks of time. This approach enables faster running times, more scenario replications, and more thorough analysis results.

The Viskit Graphical User Interface (GUI) written in Java is used to implement the event graph methodology. The Simkit GUI allows for statistical analysis of a simulation. The Diskit, Java API (application programming interface) extends the SIMKIT libraries. The DISKIT libraries enable the use of the IEEE Distributed Interactive Simulation Protocol (DIS) allowing the animation of 3D objects in a virtual environments and communications between different simulations. The Viskit, GUI allows the user with event graph knowledge to create computer simulation leveraging Simkit and Diskit libraries. It is important to recognize that the user does not need to know how to write Java code, he just needs to know how create an event graph. The event graph produced using the Viskit GUI is then saved as XML documents. This XML documents are transformed into JAVA source code using JAXB implementing the SIMIKT and DISKIT libraries.
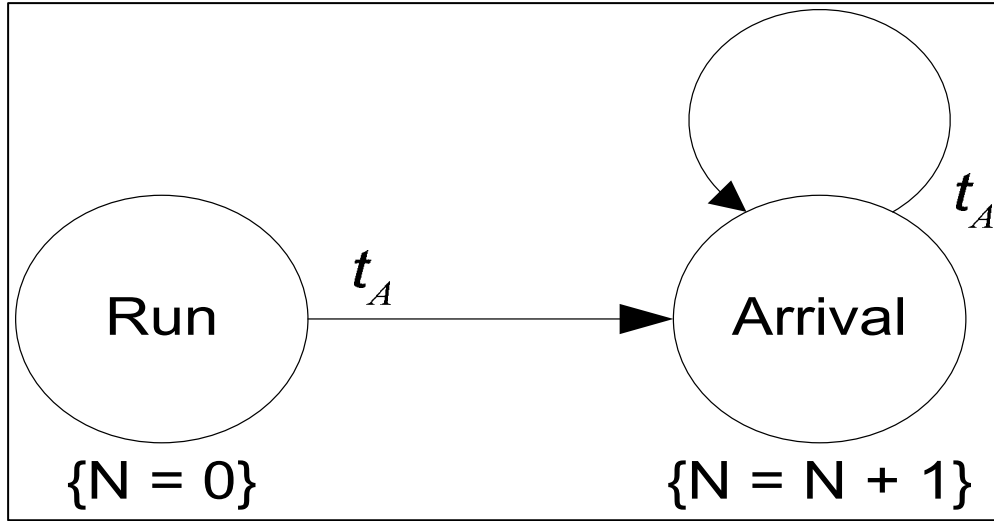
Figure 2.   The above figure is an example of the run method in event graph notation (from Buss 2004)

The 3D model of the scenario which corresponds to the assembly file created by SavageStudio is created in Extensible 3D Graphics X3D Standard (Brutzman, Daly 2007). X3D graphics is an ISO standard used in web pages, database applications and visual simulations. For more information regarding these topics refer to LT. Sullivan's thesis (Sullivan 2006).

E.   INSTRUCTIONAL SYSTEM DESIGN

The Instructional System Design (ISD) approach is the guiding methodology used in the lesson development for this study. The goal of the ISD approach is to select and use the correct instructional system to deliver the required knowledge to the learner. The development of the instructional system is structured in 3 parts: input, process and output. (Ford 1996)

The input portion is for the ISD is intended to help understand the differences in the learner's experience levels, the learner's current level of knowledge about the subject, and the motivations of the learner. This information can be summarized as the learner's background coupled with the desired goal of the instruction. The process portion is for the ISD develops the course and the media that delivers the instruction to the learner. The

output portion for the ISD is used to evaluate the effectiveness of the training to ensure that the system meets the training goals. Figure 3 contains the ISD concept map by Donald Clark.
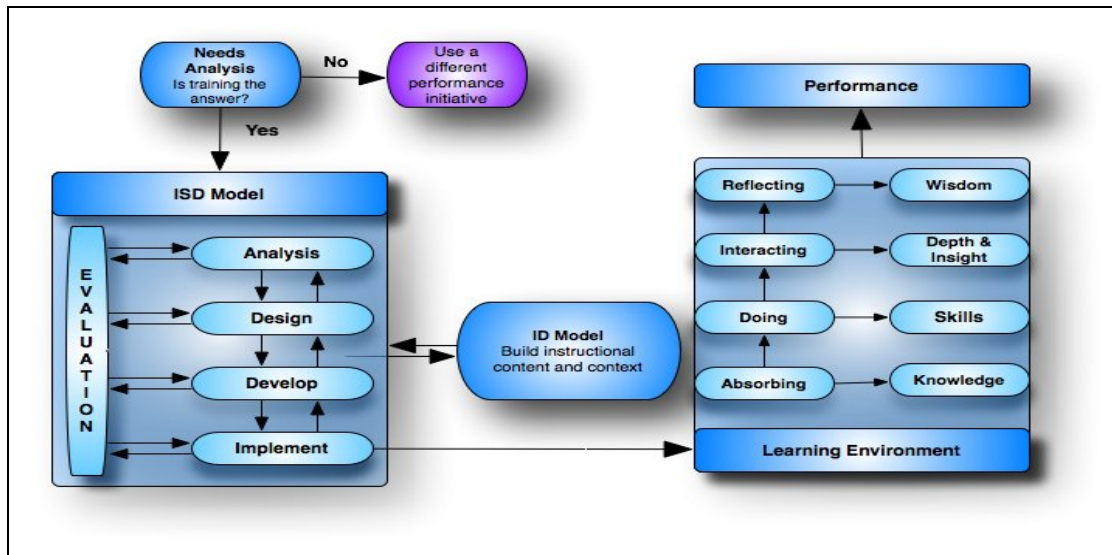
Figure 3.   Instructional System Design (ISD) design concept map by Donald Clark
http://www.nwlink.com/~donclark/hrd/sat2.html (1995).

There are more than 100 different ISD models (Kruse 2007) but almost all are based on the "ADDIE" model. The ADDIE model, which stands for Analysis, Design, Development, Implementation and Evaluation, is used by the training community to standardize instruction and to impose consistent quality standards (Ciavarelli 2007). An ADDIE model as described by Steven J. McGriff is depicted in Figure 4. A major benefit of using the ADDIE model is that each step's outcome feeds the subsequent steps, ensuring that developers don't proceed to subsequent steps without first completing the previous necessary step.
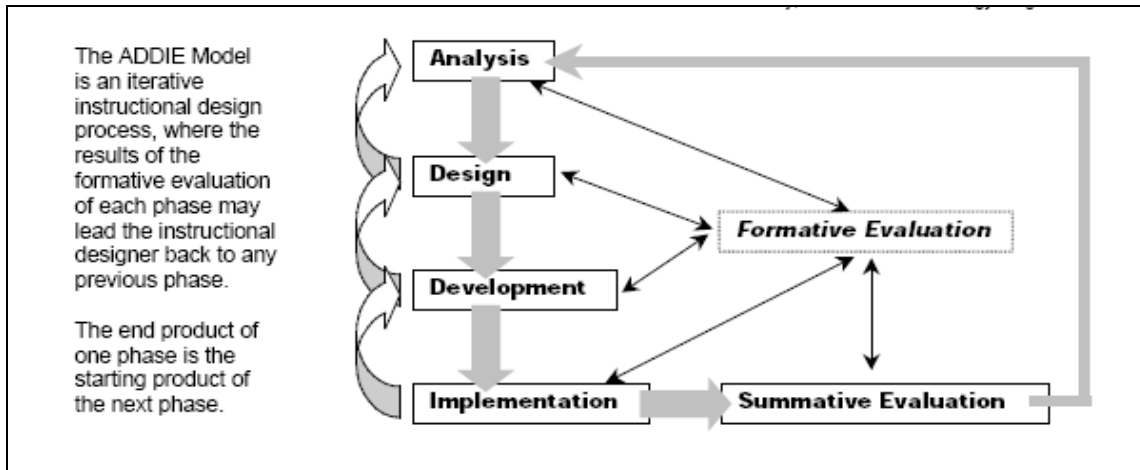
Figure 4.   ADDIE model as described by Steven J. McGriff, Instructional Systems, College of Education, Penn State University (2000).

The ADDIE model steps are briefly summarized in the following paragraphs.

In the Analysis phase the problem needs to be defined using a job task analysis, determining what training is needed and why it is important. Developers identify the possible solutions to the problem, using task analysis, developers can explicitly define roles, tasks and outcomes of the targeted training. Developers define a sequence of tasks coupled with the required equipment that facilitate the execution of the task and measures of job performance are provided. The target audience has to be identified, developers need to analyze their knowledge and skills in order to determine what they need to complete the training and achieve satisfactory performance. The outputs of this phase are the inputs for the Design phase.

The Design phase uses the outputs from the Analysis phase to plan a strategy and build a blueprint for the training program. First the scope of the project is defined; writing objectives course content test and evaluation, delivery system and instructional strategies and sequence of instruction and resources.

The Development phase uses the outputs of the design phase to generate lesson plans, student and teacher guides and the instructional materials required to complete the lessons. Here the actual training program is constructed using courseware authoring and software as specified in the design (Ciavarelli 2007).

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The Implementation phase has two parts. The pilot phase creates or designs a pilot study and then delivers the instruction to a small group of subjects to test the efficacy of the training instruction. After the pilot study is completed, the second part is to revise the prototype and then deliver the overall training solution to the end-user population.

The Evaluation phase measures the overall effectiveness of the training. Even though the evaluation phase is the last phase of the ADDIE model, developers are constantly evaluating the system to correct or improve the instruction before the final implementation. Thus evaluation takes place in all the phases of ISD (Ciavarelli 2007). The final version of evaluation determines whether the training program achieves the desired results and meets the proposed objectives.

F.   COMPUTER-BASED TRAINING (CBT) VERSUS CLASSROOM INSTRUCTION (CI) EFFECTIVENESS

The literature on CBT effectiveness reveals mixed results. Individual studies provide examples of CBT performing better, worse or having no effect. A 1992 IBM study demonstrated an up to 70 percent decrease in training time, with learning gains over 50 percent (Whitehouse & Pellegrin, 1995). Coppola and Myre (2002) addressed several previous studies that claimed CBT was not as effective as Classroom Instruction (CI). In Wilson, Majsterek and Simmons (1996) four elementary students with learning disabilities performed worse with 'Mathblaster' CBT than with flashcards in a CI setting. In Lee (1994) twenty six teachers did not learn well when they where required to use a CBT program to teach BASIC. Coppola and Myre cited those studies as examples to demonstrate alternate hypotheses that must be controlled for such as computer skills and attitude towards the material.

When multiple studies are evaluated together, those cases that show significant differences in performance between media appear to be outliers. They can be explained by alternate hypotheses, or used evaluation samples that are not representative of the target population. Chumley-Jones, Dobbie and Alford (2002) reviewed 76 articles from 1966 to 2002 about medical, dental and nursing CBT. They observed that studies with control groups where the educational content was constant demonstrated no difference in

knowledge gains. A meta-analysis of 96 studies from 1996 to 2005 reached a similar conclusion. Sitmann, Kraiger, Stewart and Wisher (2006) evaluated studies of adults 18 years or older comparing WBL and CI for job-related training programs. Training times ranged from one to 120 days. Only studies that provided enough data to allow for the calculation of a *d* statistic, or where the author provided such data when requested, were used. The various aspects of each study, such as response time, same or different method, experiment or case study etc., were then converted to a normalized scale by two raters with a third rater breaking any ties. They then looked at a subset of the studies that used a true experimental design, a subset that used equal instructional methods, and a subset that looked at using CBT in addition to CI. They further separated instruction of declarative or procedural knowledge within each of the main subsets. Results are summarized as follows.

> The overall results indicated WBI was six percent more effective then CI for teaching declarative knowledge, the two delivery media were equally effective for teaching procedural knowledge. However, WBI and CI were equally effective for teaching declarative knowledge when the same instructional methods were used to deliver both WBI and CI, suggesting media effects are spurious and supporting Clarks (1983, 1994) theory (p. 623).

Clark's theory is best demonstrated by his often-cited truck analogy. "The best current evidence is that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition (Clark, 1983, p. 445)."

Hastings and Tracey (2005) evaluate the articles and counter articles written by Clark in 1983 and 1994 and Kozma in 1991 and 1994. "His [Clark's] position has always been that any given method can be developed for delivery by more than one medium. In 1983 and even 1994, Clark's argument was valid. In 2005 it is valid for many, but not all, instructional methods and delivery medium pairings. We assert that today, computers have unique, non replicable capabilities and therefore can support instructional methods that other media cannot" (p. 29). Hastings and Tracey purport advances in computers and the Internet over the last 22 years have transformed Clark's computer-as-a-truck into a supersonic jet. As an example, in 1991 Kozma mentions that due to size and weight one

is more likely to learn from a book than a computer while riding a bus, but that may change with advances in technology. Kozma asserts computers have unique qualities that if utilized properly, can make CBT more effective than CI.

Greitzer (2002) describes how content developed for CBT was adapted for CI instruction, thus improving both. The results reported by Sitzmann et al. (2006) and Schlager (1994) are directly applicable to the U.S. Navy because they only looked at true experiments on adults with at least basic computer and learning skills. There are many case studies, quasi-experiments and experiments to support claiming an advantage of CBT or CI. When one looks only at studies in which true experimental methods were used, comparing the same material given to subjects similar to the population of the U.S. Navy, no difference was found between CBT and CI.

G.   SUMMARY

This chapter reviews prior Naval Postgraduate School (NPS) theses that served to motivate this thesis work. It also discusses the Anti-Terrorism Officer Level II course (ATO Level II course), the Scenario Authoring and Visualization for Advanced Graphical Environments (Savage) Studio simulation environment and the Instructional Systems Design (ISD) concept used in the completion of this thesis. Relevant research about training effectiveness between Computer-Based Training (CBT) and Classroom Instruction (CI) is discussed. Additional information on the topics related to this thesis can be found in the references section at the conclusion of this thesis. Further information and greater in-depth knowledge of the subjects' is provided in the list of references.

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III.   ANALYSIS, DESIGN AND DEVELOPMENT

A.   INTRODUCTION

This chapter provides an in-depth look at the analysis, design and development of the lessons implemented using the CBT and SavageStudio scenario generation tool. The use of the instructional design model helps to ensure that the instruction developer makes important choices about the course structure and methods, thus ensuring that the training objectives are achieved.

B.   ANALYSIS

1.   Needs Analysis

With the revolution in Training (Executive Review of Navy Training 2001) the United States Navy has been looking at new or alternative technologies to provide training to its sailors. The U.S. Navy is restructuring some of its courses to allow for the delivery of the material using Computer and Simulation-based technologies. During the last decade, the terrorist threat has been increasing as evidenced by terrorist attacks against U.S. forces around the world. There is a great need to train Naval and Marine Corps Officers and Senior Enlisted in the concepts of AT/FP. As operational tempo imposed by the GWOT increases, instructors need to look to other to look into technologies that allow sailors to be trained to their fullest potential anywhere at any time.

Clearly the Navy's needs are:

1. Efficient or effective technologies that encourage faster learning and efficiency implementing the concepts.

2. Training delivery both ashore and afloat using established infrastructure.

2.   Task Analysis

Formal task analysis helps the developer determine what specific tasks need to be accomplished in order to fulfill each learning objective. Tasks are broken down in

subtasks, and each subtask is matched to a learning objective. The task analysis also helps developers build performance measures that help to determine student success or failure when performing the task. A detailed task analysis supporting the objectives of this thesis is provided in Appendix A.

3. Audience

A thorough understanding of the participants is essential for developing successful instructional material. There is a need to develop an audience profile to ensure that the instructional design is compatible with the students' skill and knowledge level. The lessons in this course are intended for Officers and Senior Enlisted assigned to AT/FP duties. The group of Officers is comprised of all Naval Officers, all Marine Corps Officers, Limited Duty Officers in the military police rates and Senior Enlisted in the Fire Control, Gunners mates and Master at Arms rates. Given the nature of the military rank structure, most Limited Duty Officers and Senior Enlisted in the mentioned rates often possess some post-secondary college education or degree. This indicates that Officers and Senior Enlisted continued their education during the course of their military service.

Commissioned Officers are required to have a college degree. With the implementation of IT-21 and the Navy Marine Corps Internet (NMCI) and the educational background of the audience, it can be assume that they have at least basic computing skills necessary for the applications used in this research. The level of enthusiasm is high among the students selected to attend the course, and they are usually selected to attend the course due to high level of confidence by their superiors.

The background knowledge that the students have in the Force Protection subject varies, from basic to advanced. Some Naval Officers ranks O-1 thru O-3 have basic knowledge, while the Limited Duty Officers and the Senior Enlisted have more advanced knowledge and have been exposed to the subject since some have served in the AT/FP rates.

C.   DESIGN

1.   Learning Objectives

The learning objectives are the center of each lesson design and help describe the knowledge, skills and attitudes (KSAs) expected of the student after completion of the lesson activities. By meeting the learning objectives the student will be able to achieve the course goal. The objectives clearly state what the student is expected to know (knowledge) or perform (skill) at the end of each lesson, and to what degree in order to properly demonstrate successful completion of the objective.

The overall student learning objectives for the ATO course are defined as:

1. Manage the overall Anti-terrorism Program as the Commanding Officer's primary advisor for a shore-based or afloat command, including personnel, physical resources, and training requirements.

2. Develop and implement Pre-Planned Responses that will be effective mechanisms to detect, deter, defend and mitigate likely terrorist threats against U.S. Navy assets and installations.

3. Assess the anti-terrorism environment, situation and unit readiness for an ashore or afloat command, given current contingencies and sources of information.

4. Develop a comprehensive Anti-terrorism Plan incorporating anti-terrorism principles, concepts, program elements and standards across the range of military operations, at any echelon of command both afloat and ashore, utilizing the AT planning process.

The learning objectives for the created lesson are defined as:

1. Define the importance of the Defense in Depth concept in accordance with Navy AT/FP Tactics, Techniques and Procedures (TTP).

2. Apply the procedures of the Defense in Depth concept to a ship's in-port preparations.

3. Assess the anti-terrorism environment and situation to identify port vulnerabilities.

4. Define and assess the anti-terrorism environment and situation to identify critical assets and vulnerabilities for a ship in-port.

5. Assess the anti-terrorism environment and situation to develop a plan that mitigates vulnerabilities to an acceptable risk for a ship in-port.

6. Assess the anti-terrorism environment and situation to assess risk to a ship in-port and develop appropriate countermeasures.

7. Define and assess the anti-terrorism environment and situation to identify and quantify the threat.

8. Define and assess the anti-terrorism environment and situation by identifying critical assets and vulnerabilities and discuss force protection employment to protect these assets.

9. Define the assessment zone as presented in the Defense in Depth concept and in accordance with Navy AT/FP TTP.

10. Demonstrate the application of the assessment zone as described in the Defense in Depth concept and in accordance with Navy AT/FP TTP.

11. Define the warning zone as described in the Defense in Depth concept and in accordance with Navy AT/FP TTP.

12. Demonstrate the application of the warning zone as described in the Defense in Depth concept and in accordance with Navy AT/FP TTP.

13. Define the threat zone as described in the Defense in Depth concept and in accordance with Navy AT/FP TTP.

14. Demonstrate the application of the threat zone as described in the Defense in Depth concept and in accordance with Navy AT/FP TTP.

15. Define the purpose of pre-planned responses in accordance with Navy AT/FP TTP and NTTP 3-07.2.1 (Rev A).

16. Define the likely terrorist threats by applying the pre-planned responses concept in accordance with Navy AT/FP TTP.

2. **Performance Standards**

Upon completion of the lesson the student will be able to:

1. Successfully define the importance of the Defense in Depth concept in accordance with Navy AT/FP TTP.

2. Successfully identify the definition among other distracters of Defense in Depth concept in accordance with Navy AT/FP TTP.

3. Successfully apply the procedures of the Defense in Depth concept to ship in-port security scenario by:

   a. Correctly identify port vulnerabilities.

   b. Correctly identify own high value assets that need protection.

   c. Correctly identify own critical assets vulnerabilities.

   d. Mitigate vulnerabilities to an acceptable risk.

   e. Correctly establish a warning zone.

   f. Correctly establish a threat zone.

   g. Correctly establish an assessment zone.

   h. Correctly employ force protection assets to protect high value assets.

   i. Assessing risk.

   j. Develop countermeasures.

   k. Identify and quantify the threat.

4. Successfully assess the anti-terrorism environment and situation given intelligence reports and visual aids.

5. Correctly define the purpose of pre-planned responses in accordance with Navy AT/FP TTP and NTTP 3-07.2.1 (Rev A).

6. Successfully identify the definition among other distracters of the purpose of pre-planned responses in accordance with Navy AT/FP TTP and NTTP 3-07.2.1 (Rev A).

7. Complete an examination with an 80% correct answer rate of the following terms:

a. Layered defense concept definition and application.

b. Assessment zone definition.

c. Warning zone definition.

d. Threat zone definition.

e. Define the purpose of the assessment, warning and threat zones.

f. Organization of the Naval Vessel Protection zone.

g. Assets used in the assessment, warning and threat zones.

h. Watch-stander actions in the assessment, warning and threat zones.

i. Watch-stander determination of threat.

j. Definition and purpose of pre-planned responses.

k. Identify future threats as defined by Navy instructions.

3.   Enabling Objectives

The enabling objectives determine the pre requisite skills required for completion of each specific learning objective. Enabling objectives define the execution of the required tasks that accomplish each specific learning objective. Enabling objectives for the lesson prepared in this thesis are detailed in Appendix B.

4.   Media Selection

The learning objectives can be presented to the student using several teaching strategies, including lecture and practical exercises. The teaching strategy that can be used can be either classroom lecture or CBT lecture with simulation. The media selection used has to be based on the needs of the Navy and the technology that allows the proper implementation of the learning objectives. A detailed explanation of the methodology used for media selection can be found in Appendix C.

To determine which media can be used for a Navy-wide prototype, the following questions need to be assessed:

1. How many people need the training?

2. Is classroom instruction viable and cost effective?

3. Can all the target audience participants attend the training?

4. Do the participants need the instruction as refresher training?

5. Do the participants need immediate feedback from subject matter experts?

6. Do participants have adequate technology to perform the training?

7. Will the training be self- paced or sequenced by classroom schedules?

After assessing the Navy's current and future capabilities it has been determined that the lessons can be viewed using any current Navy Desktop workstation with the following minimum requirements:

Operating system: Windows, Macintosh or Linux

Video Cards: Standard

Memory 512 MB Single Channel DDR2 SDRAM

Hard Drive: 60 GB Hard Drive (7200 RPM)

Monitor: Standard

Optical Drive: 24X CD ROM

Sound: Standard speakers or standard headphones

Mouse: Standard, ergonomic design

5.   Resources

The resources used for the development of the lessons were provided by the Center for Security Forces (CENSECFOR) 1575 Gator Boulevard, Suite 226, Norfolk, Virginia 23521-2751. Additional ressources for the X3D content of the course were provided by the SAVAGE research group in the MOVES Institute at the Naval Postgraduate School.

D.   DEVELOPMENT

Lessons were constructed using the instructional material currently used in the ATO Level II course provided by CENSECFOR. Due to the experimental subjects' time constraints and availability the lessons used for this thesis were modified from those used in the ATO Level II course to accommodate for these constraints and to allow for the proper completion of the tested lessons. After the task analysis was completed, scenario storyboards (detailed storyboards are located in Appendix D and Appendix E) were created for the two studies that are covered in this thesis. During media selection it was determined that for the delivery of the knowledge objectives of the course is used Articulate Presenter trial version software and use the SavageStudio for the delivery and performance assessment of the skill objectives in the study.

Articulate Presenter trial version (www.articulate.com) is a Flash authoring tool that was used for the transformation of the storyboards into Flash media. The software allows the developer to add visual graphics, notes and audio to the storyboards creating interactive movies. For a full tour, demos and an overview of the Articulate software are at (http://www.articulate.com/products/presenter.php).

SavageStudio was used to develop the scenarios used for the skill objectives performance and assessment. SavageStudio was used in the scenario generation allowing the user to create complete simulations with minimal setup. SavageStudio provided the scenario creator (student) with drag and drop interfaces for minimum preparation on how to use the software.

The created prototype used for data collection employs a mixed-mode approach where the instructor uses both CBT and X3D graphics for instruction and scenario development. The subject matter expert is available during the instruction to assist and answers any student questions.

1.   Instructional Materials

The storyboard created for the CBT vs. CI effectiveness comparison (Lesson 1) is located in Appendix D

The storyboard created for the CBT effectiveness (Lesson 2.1) is located in Appendix E.

E.   SUMMARY

This chapter provides an in-depth look at the analysis (task analysis and target audience), design (learning objectives, performance standards, enabling objectives, media selection, and resources) and development of the developed lessons for the AT/FP course using the ISD framework. These lessons can be used for the AT/FP course in conjunction with the SavageStudio scenario generation tool. The ADDIE model was used to ensure that the course objectives meet the ATO Level II course objectives. This methodology is advisable and suitable for other courses.

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IV. METHOD

A. INTRODUCTION

This chapter provides an in-depth look at the two studies conducted during this thesis research. The chapter is divided in the following manner: study I AT/FP CBT versus CI, and Study II Training effectiveness of the ATFP CBT with Simulation. The participants, variables measured, apparatus and procedures used in the implementation are presented.

B. STUDY I

1. Participants

The pool of volunteer participants for study I was comprised of 16 students of the OA 3402 course and other MOVES students attending the Naval Postgraduate School. The students of the course are Navy and Marine Corps and officers ranks range from O-2 to O-4 male and female.

Study I Participant's Information				
RANK	RATE	GENDER	AGE	SERVICE Yrs, Mo.
O-3	USN, SWO	F	34	10
O-4	USN, PILOT	M	35	13.9
0-2	USN, HR	M	25	3.6
0-3	USN, SWO	M	34	16.2
0-3	USN, SWO	M	27	4.9
0-4	USN, PILOT	M	33	11
0-3	USN, SWO	M	32	14
O-4	GERMAN, ARMY	M	27	6
O-4	USN, IP	M	34	15
O-3	USN, IP	M	34	14.6
N/A	CIV	M	35	10
N/A	CIV	M	33	10
O-4	GERMAN, NAVY	M	32	12
0-3	USN, HR	M	31	8
0-3	USN, HR	F	29	7

Table 1.   Study I Participant's information.

The participant's previous assignments include Navy ships, Navy submarines, shore installations, and aviation commands ashore and afloat. The treatment of subjects was in accordance with the ethical standards of the American Psychological Association (APA).

2.   Experimental Design

The independent variable for this experiment is the mode of delivery, media, of instruction. Two conditions of the independent variable are considered, CBT and CI. The dependent variable was post-test scores. Scores were taken after completion of the training. Demographics of interest include: age, gender, military branch, type and number of past duty assignments (jobs), education level, learning style and computer skills.

The purpose of study I, was to determine if there is a difference in performance between groups that received lessons with the same content using different media delivery, namely CBT and CI. Answering this question is a first step in determining if CBT is a viable, cost-effective and flexible alternative to CI training for AT/FP training requirements. Study details follow.

A. All assessments where done using printed material.

B. The following experimental design was used to compare CBT vs. CI media effectiveness. Participants received AT/FP training using different media delivery methods CI, CBT. Pre- and post-tests were conducted to examine mean differences between groups after training was completed. Table 2 shows the experimental design for Study I.

Instructional Media	Pre-Test	Treatment	Post-Test
CBT	X_0	O_1	X_1
CI	X_0	O_2	X_1

Table 2. Study I Experimental Design. O_1 refers to CBT treatment and O_2 refers to CI treatment.

Null hypothesis: Mean score of post-test for the CBT group equals the Mean score for the post-test of the CI group.

Alternate hypothesis: Mean score of post-test for the CBT group does not equal the Mean score for the post-test of the CI group.

3. Apparatus

The classroom training, used the NPS Human Systems Interaction and Learning (HSIL) lab, 1 Dell Precision M90 computer 2.33GHZ with 2.00G RAM that contained the slides created by the subject matter expert (SME). The power point slides were created using learning and enabling objectives used in the Anti-terrorism Officer Course Level II. The operating system for this computer is Windows XP Professional Version 2002 with Microsoft Power Point version 2003. The projector is Sony VPL-X1000 with a resolution of 1024 X 768, 1100 lumens.

The CBT portion of the research used each student's personal laptop. The pre-test and post-test were done as part of the CBT. The CBT will be created by the SME using the 'Articulate' presenter professional software, using the same learning and enabling

objectives used in the creation of the Power Point slides. The CBT used the same images and text as the CI power point and included a voice narration of the information spoken by the instructor in the CI.

4. Procedure

Participants were assigned at random to the classroom instruction or to the CBT instruction groups depending on the last digit of their social security number. Participants assigned to the classroom instruction group were first briefed orally and in writing by the subject matter expert on the Institutional Review Board (IRB) process and then asked to complete the student background surveys. After completion of the surveys, the students were instructed to complete a pre-test on the AT/FP topic of instruction. Upon completion of the pre-test, students were instructed to sit in a classroom where classroom instruction on the AT/FP topic was conducted using an SME (this author) as a facilitator. After completion of the classroom instruction, students were instructed to conduct a post-test on the AT/FP topic of instruction.

Participants assigned to the CBT instruction group were briefed on the Institutional Review (IRB) process and asked to complete the student surveys. After completion of the surveys, the students were instructed to complete a CBT embedded pre-test on the ATFP topic of instruction. Upon completion of the pre-test, students were instructed to proceed with the CBT lesson. After completion of the CBT lesson students were instructed by the CBT to conduct a CBT embedded post-test on the AT/FP topic of instruction.

C. STUDY II

1. Participants

The pool of volunteer participants for study II is comprised of 20 Officers (2 females and 18 males) of the following Naval and Marine Corps communities: Surface Warfare Officers (SWO), Information Professionals (IP), Meteorological Officers (METOC), Communications Officers (COMMO, USMC), Pilots, Naval Flight Officers (NFO), Intelligence Officers (IW), Human Resources (HR) and Medical Officers (MD),

all attending the Naval Postgraduate School. The participant's previous assignments include Navy ships, Navy submarines, Navy and Marine Corps shore installations and aviation commands ashore and afloat. The participants age range from 26 years old to 42 years old with an average age of 33 years. The participants' rank from LT/O-3 USN or Capt./O-3 USMC to CDR O-5 USN. The participants' total military service time range from 5 years to 19 years of military service time, with an average military service time of 12.63 years. The participants reported that 14 had attended AT/FP training courses and 6 had not attended AT/FP courses. The participants reported the following regarding their perceived knowledge of AT/FP: 3 participants report no AT/FP knowledge, 3 participants report less than basic AT/FP knowledge, 11 participants report having at least basic AT/FP knowledge, 3 participants report having reasonable knowledge (more that the basic knowledge) of AT/FP, and no participant reported having expert knowledge of AT/FP. Participants also reported no previous AT/FP training in the last 12 months while in their present command. Most participants reported to having AT/FP training once a year in their previous command, however some reported AT/FP training weekly, monthly and semi-annually in their previous commands. The treatment of subjects was in accordance with the ethical standards of the APA.

Study II Participant's information					
Rank	Rate	Gender	Age	Total Time in the Military	Previous Knowledge
O-4	Commo	male	39	12.3	0
O-3	IP	male	29	6	1
O-3	Sub	male	36	17.05	1
O-5	Human Resources	female	42	18.85	1
O-4	NFO	male	34	13.5	1
O-3	Metoc	male	29	8.15	1
O-3	Metoc	male	37	18.45	1
O-4	SWO	male	37	18	0
O-4	Doc	male	34	17	1
O-3	Commo	male	34	15. 8	1
O-3	Metoc	female	32	10	1
O-3	Intelligence	male	35	16	1
O-3	SWO	male	27	6	1
O-3	IP	male	34	14	1
O-3	Pilot	male	31	8.67	0
O-3	Intelligence	male	35	6	0
O-3	IP	male	26	5	0
O-3	Commo	male	31	14	1
O-3	SWO	male	33	16	1
O-3	IP	male	37	15	0

Table 3.   Study II Participant's information.

2.   Experimental Design

The purpose of study II is to determine the effectiveness of the ATFP instruction, namely the improved performance of students after completing the ATFP lesson and simulation). Answering this question is a first step in determining whether future studies on AT/FP training and simulation can be used to compare against classroom instruction.

The independent variable for this experiment is the treatment, namely combined AT/FP lesson and simulation-based training. The dependent variable for this experiment was post-test scores, namely, individual knowledge of each individual on the AF/FP topic (cognitive) after lesson completion. Another variable considered is the number of successfully completed tasks for a particular scenario using SavageStudio. Scores were taken during task execution and evaluation was performed after completion of each

scenario. Demographics of interest include: age, gender, military branch, type and number of past duty assignments (jobs), education level and computer skills.

A. All assessments were done using printed material.

B. The following experimental design was used to compare the effectiveness of the CBT with simulation. Participants received AT/FP training using CBT with simulation. Pre and post-tests were both given to examine learning effects. Table 4 shows the study II experimental design parameters of interest

Instructional Media	Observation	Observation
CBT SIMULATION	PRE-TEST	POST-TEST

Table 4.   Study II Experimental Design.

Null hypothesis: mean score of pre-test equals the mean score of post-test.

Alternate hypothesis: mean score of pre-test does not equal the mean score of post-test.

3.   Apparatus

For the learning portion of the study, the researchers set up rooms at the NPS library with 1 Dell Precision M90 computer 2.33GHZ with 2.00G RAM that contained the CBT lessons created by the subject matter expert (SME) using the Articulate trial software. The computer provided to the students also contained the SavageStudio software. The SavageStudio software can be downloaded from the Scenario Authoring and Visualization for Advanced Graphical Environments website located at https://savage.nps.edu/Savage/, description on scenario creation using SavageStudio are provided in greater detail in Chapter V.

The operating system for this computer is Windows XP Professional Version 2002 with Microsoft Power Point version 2003. For completion of the IRB forms and student questionnaires the participants used paper forms.

4.   Procedure

The students (30 total) received e-mail requests to participate in this study. Of the 30 students, 25 replied back with interest on participating, and of those 25 only 20 were able to complete the tasks due to time availability and conflicts in schedules. Students were instructed to report to the NPS library at designated times for the study. Upon reporting to the NPS library, each student was briefed on the Institutional Review process (IRB) and on the experimental procedures, written and referenced in Appendix J thru Appendix N. Students were asked to complete the student survey. After completion of the surveys, the students were instructed to complete a pre-test on the ATFP topic of instruction. Upon completion of the pre-test, students were instructed to complete the CBT instruction. After completion of the CBT, students were instructed to contact the Subject Matter Expert (SME) for further instructions. The SME directed the student to read the scenario information sheet. The SME directed the student with detailed scenario generation and execution instructions and then asked the student to use SavageStudio to generate and execute a scenario. The following paragraphs provide a summary of the student required actions, detailed scenario generation and execution instructions are provided in Chapter V. During the scenario generation, the student was asked to select a location where the scenario took place. Student then selected the assigned friendly assets HVU, patrol boxes, patrol boats, radars and barriers. Once friendly assets were selected, the student placed the assets in a location where they were more secure, based on critical vulnerabilities of the location and asset capabilities. The student was asked to define the assessment, warning and threat zones by using the assets provided namely radars and patrol boxes. Students placed and modified patrol boxes where the location of the patrol box would increase the probability of the intercept of hostile assets given the specific threat. Once the patrol boxes were completed, the student assigned patrol craft to the assigned zones. This step was repeated for a second patrol box and a second patrol craft. During the generation of the scenario the SME observed the student to see if he was

completing the specified tasks as specified on SavageStudio Exercise Student Task Checklist. The SME also proceeded to ask the student questions of how the placement of his assets addresses, port vulnerabilities, critical asset protection, and establishment of the assessment, warning and threat zones. Once the student generated a scenario using SavageStudio, the SME proceeded to ask the student to navigate the 3D scene by using the viewpoint button. The student then observed the execution of the scenario. The SME provided feedback during scenario execution regarding the student placement of his assets in the scenario. The student launched the analyst report and analyzed scenario parameters and statistical results (boat interceptions, enemy success rate) to determine if the use of assets was optimized. The student was then asked to develop friendly Courses of Action (COAs) based on statistical results from the simulation and the student was allowed to go back to the scenario generation screen to implement the generated COAs. Each student then proceeded to observe the execution of the scenario and analyzed the results. After the scenario portion of the study was completed, the student was asked to complete a post-test.

D. SUMMARY

This chapter provided an in-depth look at the two studies that were conducted during this thesis research. Detailed information is provided about each study, namely Study I AT/FP Computer-based training versus Classroom instruction, and Study II Training effectiveness of the ATFP CBT with Simulation. Pertinent information is presented in detail for each study including participants, variables measured, apparatus and procedures used in the implementation of the lessons.

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V.   SCENARIO CREATION

A.   INTRODUCTION

This chapter provides an in-depth step-by-step set of instructions for the creation of a scenario using SavageStudio. These steps include launching SavageStudio, creating a scenario, adding friendly and enemy forces, scenario execution, viewing the scenario, and loading a previously configured scenario from disk.

B.   LAUNCHING SAVAGESTUDIO

The first step for scenario creation is to launch the tool. To launch the SavageStudio application the user clicks on the SavageStudio icon and launches the application. Upon launching the application a command window with scrolling text appears on the computer screen with the information that the application is being initialized. Once SavageStudio is initialized the main application content display window is displayed in the computer screen as shown in Figure 5.
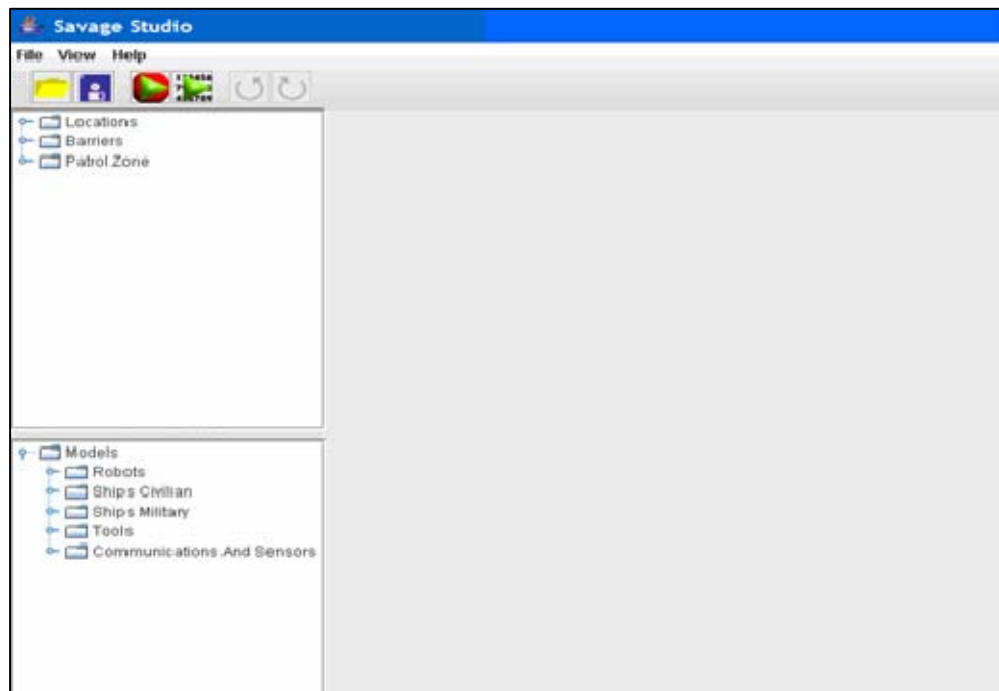
Figure 5.   SavageStudio scenario generation display window presents a blank palette for scenario configuration.

C.   SCENARIO CREATION

For this scenario example the user creates a scenario located in Bremerton Washington, then adds the following entities: one Nimitz class Aircraft Carrier that acts as our High Value Unit (HVU), a patrol area with assigned specific dimensions, two patrol boats for perimeter defense assigned to patrol inside the patrol area, and two pleasure boats that are used as explosive-laden vessels by the hostile terrorist group.

1.   Select Location

The first step in scenario creation is to select a port from the available listing of locations in the location menu selection list. Note each location may contain more than location or port. Instructions to follow.

- First place the arrow pointer over the locations folder to select a location.

- Select the locations folder by clicking the left mouse button over the key icon next to the locations folder as shown on Figure 6. All the locations contained in the folder appear on the screen below the Locations folder, as shown on Figure 7.

- Select a specific location by clicking the left mouse button on the key icon next to location, select Bremerton. A red triangle followed by the word Bremerton appears on the computer screen.

- By clicking the left mouse button over the key icon located next to the word Bremerton the map for Bremerton appears on your screen as shown on Figure 8.
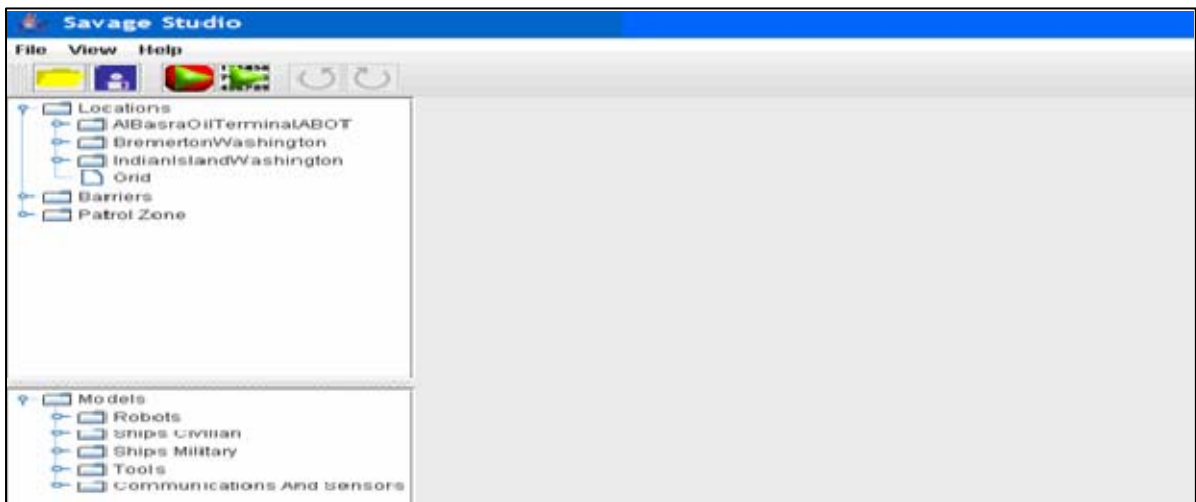
Figure 6.   SavageStudio scenario generation display window with the location menu selection folder opened.
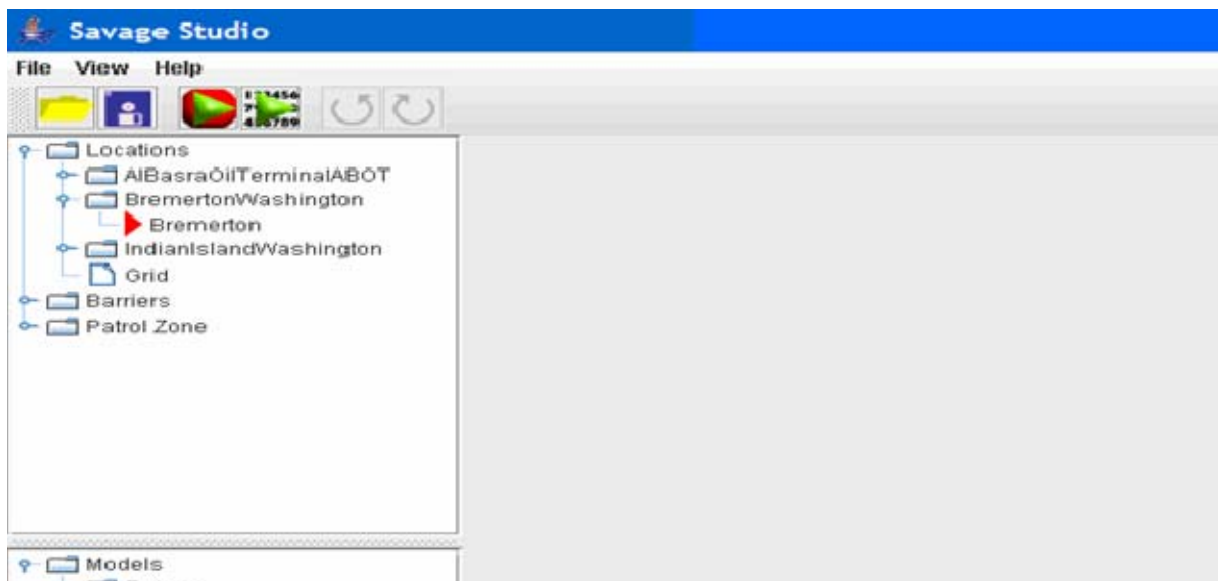
Figure 7.   SavageStudio scenario generation display, with left window depicting location and port menu-selection folders.

Figure 8.   SavageStudio scenario generation display, depicting Bremerton port selection in the left hand pane and 2D display of Bremerton in the right hand pane.

2.   Add Friendly Forces

The next step for scenario creation is to select a High Value Unit and to add other desired friendly forces from the available listing of robots, ships, tools, communications, and sensors in the models menu selection list. Instructions to follow.

- First place the arrow pointer over the ship's military folder to select a high value unit.

- Select the Ship's Military folder by clicking the left mouse button over the key icon next to the Ship's Military folder as shown on Figure 9. All the ship models contained in the folder appear on the screen below the Ship's Military folder.

- Select a specific HVU by clicking the left mouse button on the key icon next to Carrier Nimitz United States. A white paper page icon followed by the word Nimitz CVN appears on the computer screen.

- By clicking the left mouse button over the key icon located next to the word Nimitz CVN the ship model for a Nimitz class Aircraft Carrier is displayed in the computer screen as shown on Figure 10.

- The model for the Nimitz CVN is attached to the mouse pointer so the model moves as the mouse is moved over the application screen.

- To disengage or deselect the model from the mouse pointer, press the Esc key on your keyboard by disengaging the model from the mouse pointer model movement ceases and the mouse is free to be used for other purposes on the application screen.

- To engage or select the model again place the arrow pointer over the model and click the left mouse button, by completing this step the user is again allowed to move the model and place it anywhere in the application screen where the map is available.
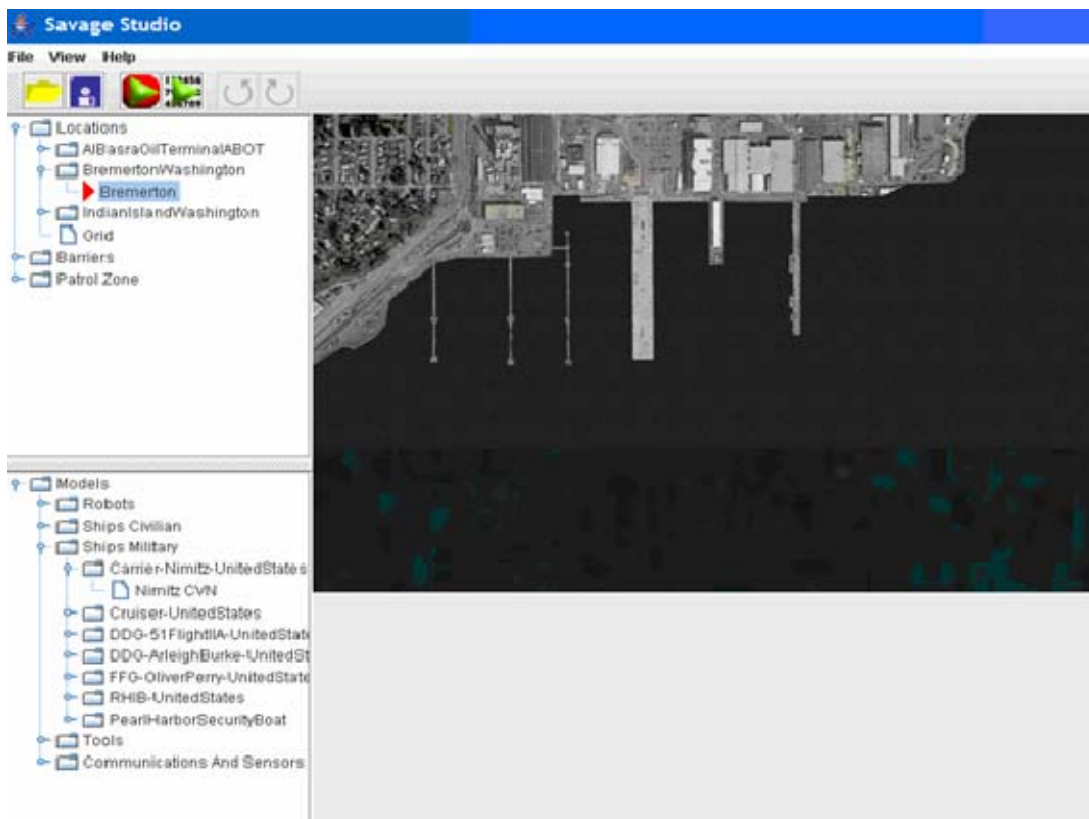
Figure 9.   SavageStudio scenario generation display window depicting the model, robots, ships, tools, communications and sensors menu folders and sub-folders.
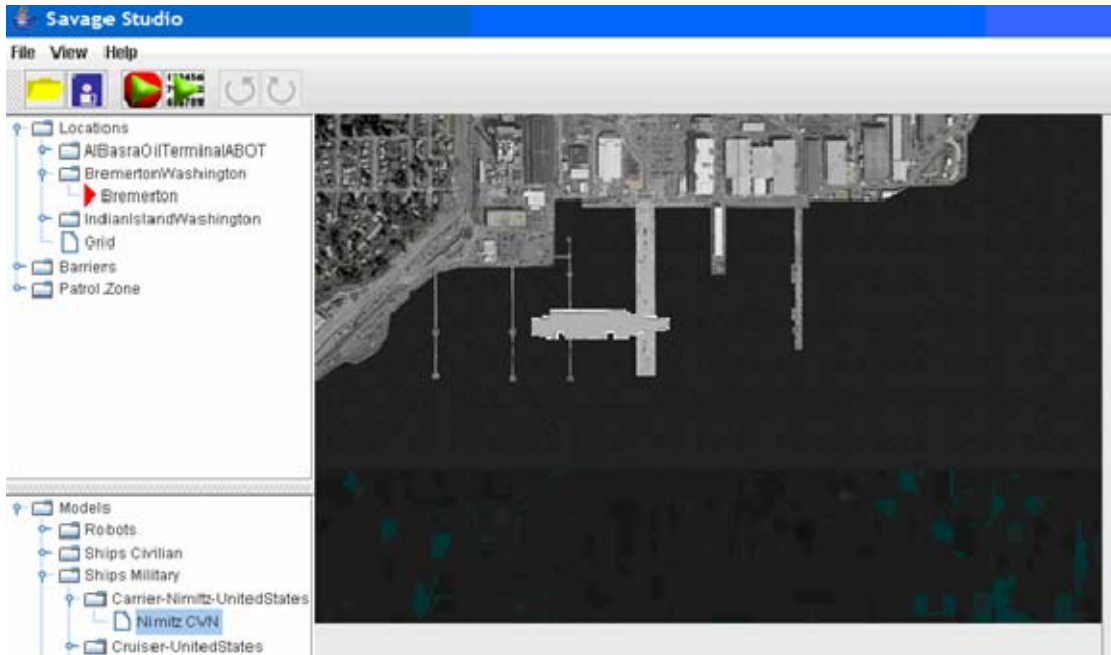
Figure 10.   SavageStudio scenario generation display window depicting a Nimitz class
Aircraft Carrier selection in the left hand pane and 2D display of a Nimitz class
Aircraft Carrier in the right hand pane.

- To manipulate the models heading meaning to rotate the model, press the up/down arrow keys located in the keyboard.

- Now that a HVU is selected the user will place the model next to a pier, note that the heading of the HVU is not the same as the pier located in the scenario.

- Using the down arrow located in the keyboard change the model's heading to match the pier's heading, in this case the Nimitz CVN bow points south towards the water as shown on Figure 12.
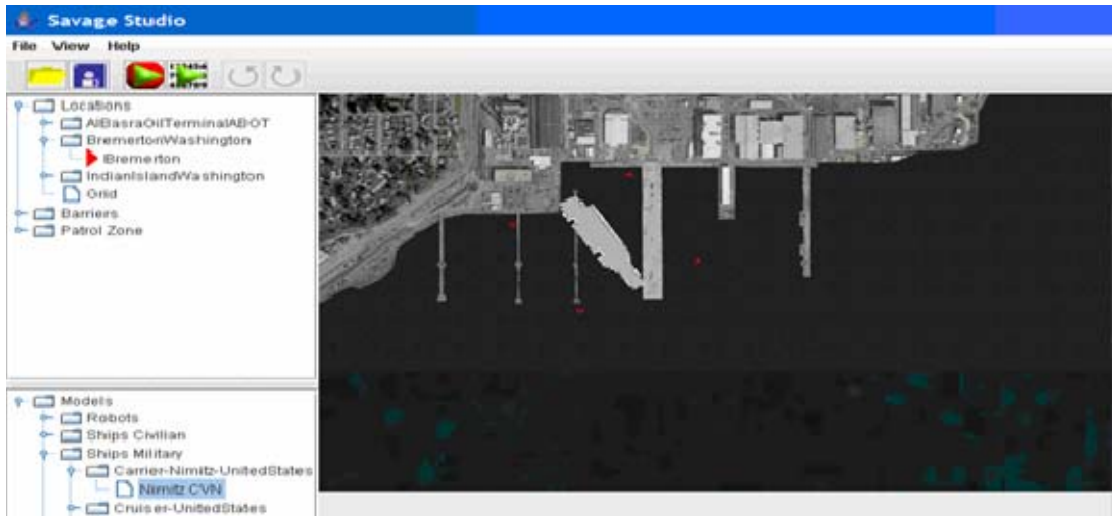
Figure 11.   SavageStudio scenario generation display window depicting a Nimitz class Aircraft Carrier rotating next to a pier.
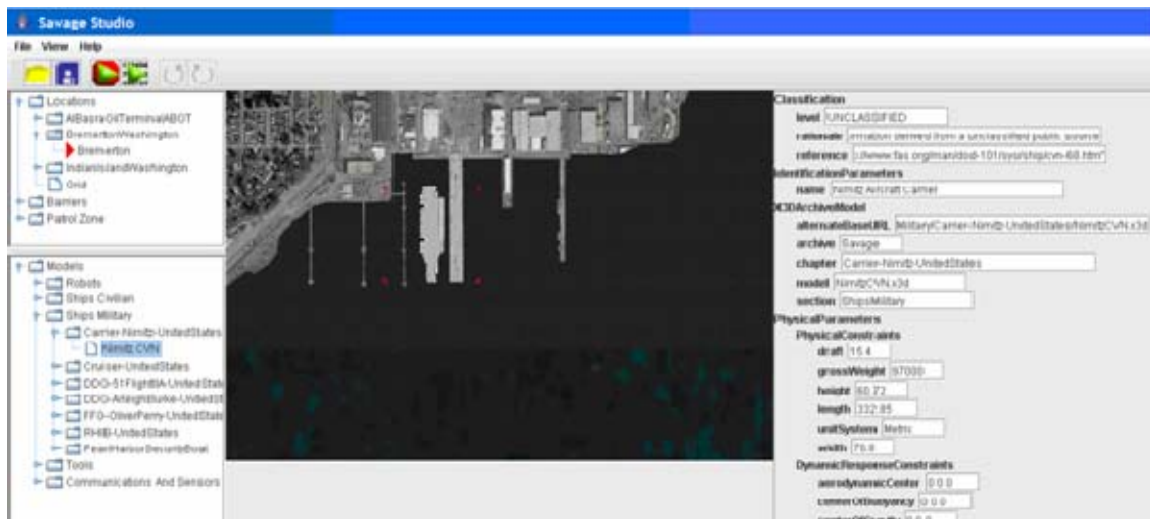
Figure 12.   SavageStudio scenario generation display window depicting a Nimitz class Aircraft Carrier located next to a pier selection in the left hand pane and the exposed metadata for the Nimitz class Aircraft Carrier in the right hand pane.

Note to the right of the map screen the model's information (SMAL metadata) is displayed while the model is selected. This information can be modified to assign a behavior or role to the particular model, so the next step is to assign the HVU behavior to this model. The default value for a model behavior parameter is set to patrol craft.

- Place the arrow pointer in the model information screen; scroll down until the behavior parameter set is viewed in the computer screen.

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- Under the Behavior parameter set there is a select box with the word type located next to it, select the folder icon.

- Once the folder icon is selected a dialog box is displayed on the computer screen, it has a set of behavior libraries, select the Savage Defense tactics folder icon.

- Once the folder icon is selected a dialog box is displayed on the computer screen, this folder has a set of tactics, select the friend folder icon.

- Once the folder icon is selected a dialog box is displayed on the computer screen, the folder has a set of individual behavior tactics, select the HVU.xml icon.

- Once the behavior is selected click on the save button, the dialog box will close and the application is back to the model information screen.
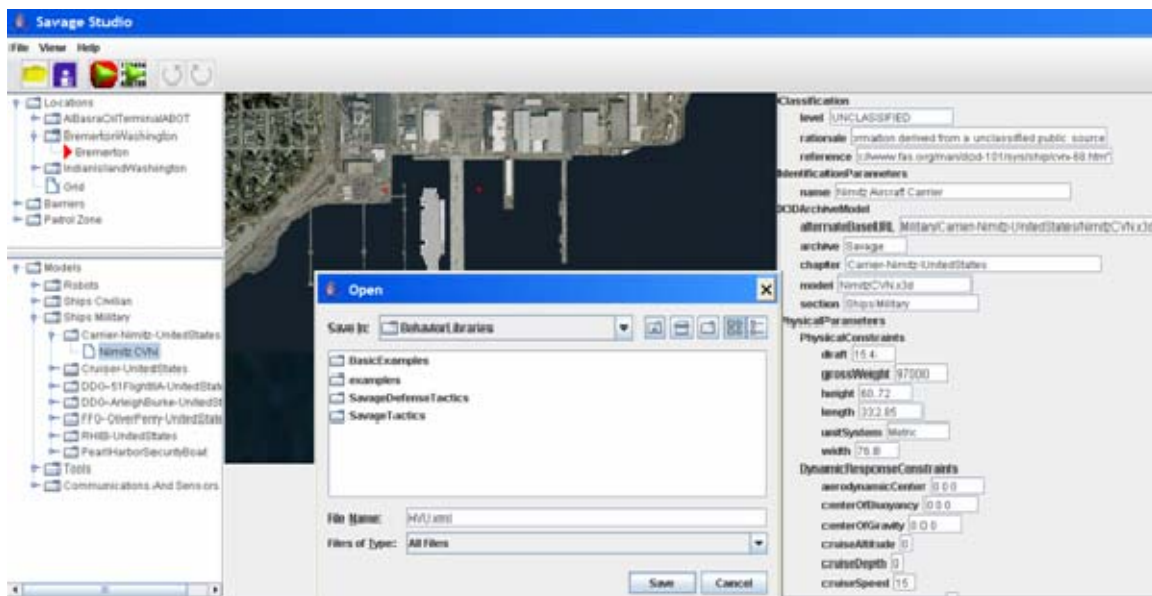
Figure 13.   SavageStudio scenario generation display window depicting the behavior libraries selection box that is being assigned to the Nimitz Aircraft Carrier.
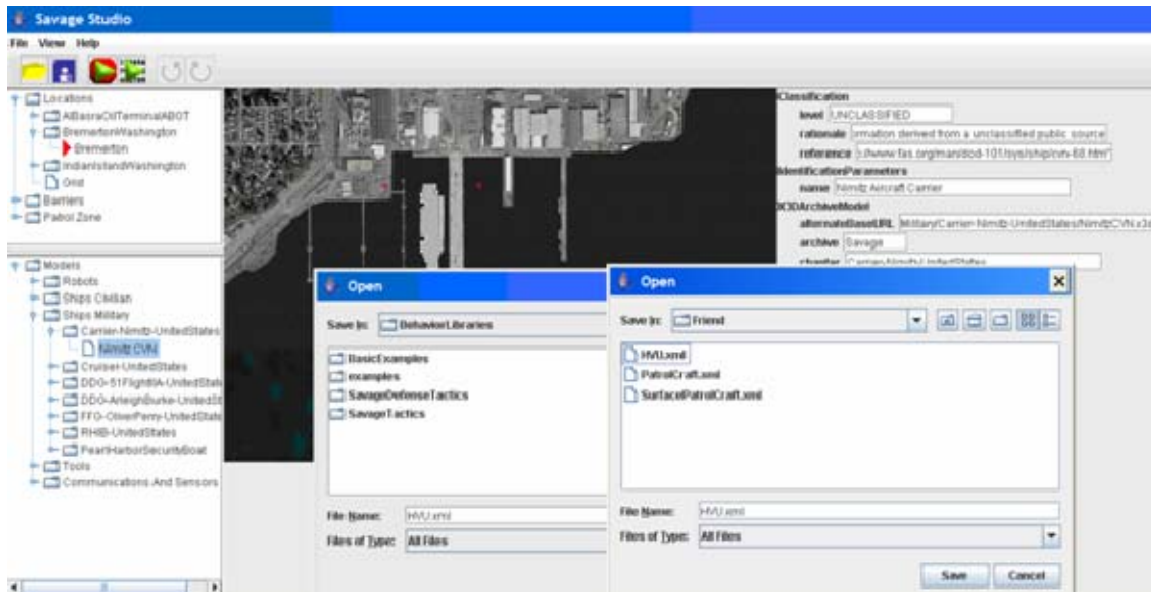
Figure 14.　　SavageStudio scenario generation display window depicting the behavior libraries selection box and the friendly assets library selection sub-menu.

The next step is to select patrol zones. For this example one patrol zone will be created. In this patrol zone the user places the military assets that patrol the area in order to protect the HVU. Patrol zones are used to determine defensive set up and measures. HVU Patrol zones are placed in the location where our assets will be more effective against an explosive laden vessel threat.

- Place the arrow pointer over the patrol zone icon.

- Select a patrol box by clicking the left mouse button over the key icon next to the patrol zone folder as shown on Figure 15. Select a patrol box by clicking the left mouse button on the white paper page icon followed by the word box, a red patrol box appears on your computer screen.

- The model for the patrol box is attached to your mouse pointer so the model moves as you move the mouse pointer over the application screen.

- To disengage or deselect the model from the mouse pointer, press the Esc key on your keyboard by disengaging the model from the mouse pointer model movement ceases and the mouse is free to be used for other purposes on the application screen.

- To engage or select the model again place the arrow pointer over the model and click the left mouse button, by completing this step the user is again allowed to move the model and place it anywhere in the application screen where the map is available.

Note to the right of the map screen the patrol zone information (SMAL metadata) is displayed while the patrol box is selected. This information can be modified to assign the patrol zone different dimensions. The default value for a patrol zone is set to 50 meters in the X direction, 0.01 meters in the Y direction and 50 meters in the Z direction.

- For this example the user makes the patrol zone 250 meters in the X direction and 250 meters on the Z direction.

- Place the arrow pointer in the model information screen select the X dimension box by clicking on top of it. Input the number 250 inside the box then press enter, repeat the same steps for the Z dimension, after completion of this steps the computer screen display looks similar to Figure 15.
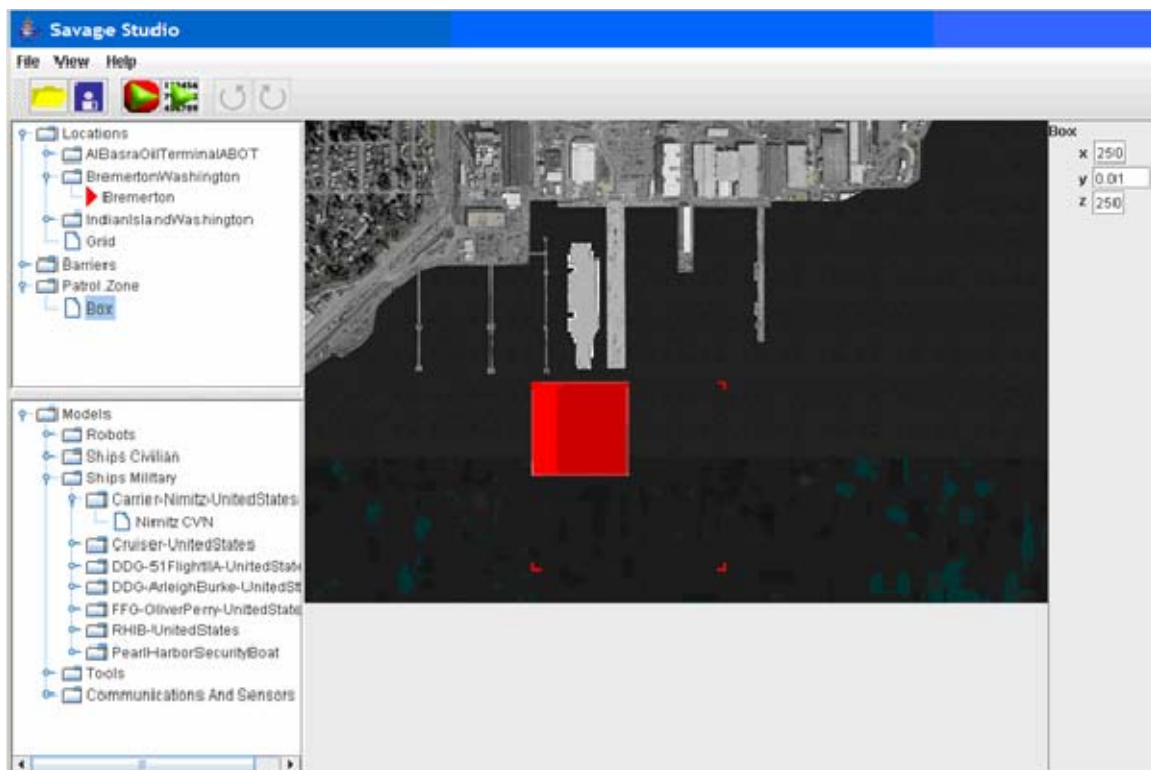
Figure 15.   SavageStudio scenario generation display window with a patrol box added.

The next step is to select patrol assets that will be assigned to patrol the area inside the patrol zone. Available assets are contained in the model folders. For this example the user uses two patrol boats. The following steps are similar to the steps used to place the HVU and the patrol zone in the application screen, therefore fewer figures are provided.

- Place the mouse arrow pointer over the ship's military folder to select a patrol asset.

- Select the ship's military folder by clicking the left mouse button over the key icon next to the ship's military folder. All the ship models contained in the folder appear on the computer screen below the ship's military folder.

- Select a specific patrol asset by clicking the left mouse button on the key icon next to Pearl Harbor security boat. A white paper page icon followed by the word Pearl Harbor security boat appears on your computer screen.

- By clicking the left mouse button over the key icon located next to the word Pearl Harbor security boat the ship model for a security boat is displayed in your computer screen.

- The model for the Pearl Harbor security boat is attached to your mouse pointer so the model will move as the mouse pointer is moved over the application screen.

- To disengage or deselect the model from the mouse pointer, press the Esc key on your keyboard by disengaging the model from the mouse pointer model movement ceases and the mouse is free to be used for other purposes on the application screen.

- To engage or select the model again place the arrow pointer over the model and click the left mouse button, by completing this step the user is again allowed to move the model and place it anywhere in the application screen where the map is available.

- To place the first security boat in the application screen, place the model on the location in the map.

- Click the left mouse button; note the security boat is still attached to the mouse pointer to place the second security boat on the location map click the left mouse button as shown in Figure 16.

- Press the Esc key to deselect the model. To manipulate the models heading as previously discussed press the up/down arrow keys located in the computer keyboard.

Figure 16.   SavageStudio scenario-generation display window depicting a Nimitz class Aircraft Carrier and the two added patrol boats on the left hand pane and the selected vehicle's metadata on the right hand pane.

Note to the right of the map screen the selected model's information (SMAL metadata) is displayed. As previously discussed this information can be modified to assign a behavior or role to the particular model. The default value for a model behavior parameter type is set to patrol craft so for the two patrol boats the behavior parameter type does not need to be changed.

- The patrol boats are assigned to patrol in the previously created patrol zone.

- Under the behavior parameters for the patrol boat to the right of the computer screen, there is a white icon with a blue cross icon labeled Zones.

- Click once on the icon and the ProbabilityZoneGeometry parameter is made available for modification and assignment, four parameters are displayed for the Zone. Next to entityID a number is displayed, the number displayed is used to identify the asset in the simulation.

- Place the mouse arrow pointer over the white square with red and blue squares connected by two green diamonds, click once on this square, the arrow pointer turns into the entityID icon that was recently selected.

- Place the entityID icon on top of the patrol zone left click the mouse button and place (drop) the entityID icon in the patrol zone located in the location map.

3.   Add Enemy Forces

The next step for scenario creation is to select and add enemy forces from the available listing of robots, ships, tools, communications and sensors in the models menu selection list. Instructions to follow.

- First place the arrow pointer over the ship's civilian folder to select an enemy asset.

- Select the ship's civilian folder by clicking the left mouse button over the key icon next to the ship's civilian folder as shown on Figure 14. All the ship models contained in the folder appear on the computer screen below the ship's civilian folder.

- Select a specific model by clicking the left mouse button on the key icon next to the speed boat. A white paper page icon followed by the word speed boat with driver high-definition appears on the computer screen.

- By clicking the left mouse button over the key icon located next to the word speed boat with driver high-definition the ship model for a speed boat with a driver is displayed in the computer screen as shown on Figure 17.

Figure 17.   SavageStudio scenario generation display window depicting a Nimitz class Aircraft Carrier, two added patrol boats and two speed boats on the left hand pane and the selected vehicle's metadata on the right hand pane.

- The model for the speed boat is attached to your mouse so the model moves as the mouse pointer is moved over the application screen.

- To disengage or deselect the model from the mouse pointer, press the Esc key on your keyboard by disengaging the model from the mouse pointer model movement ceases and the mouse is free to be used for other purposes on the application screen.

- To engage or select the model again place the arrow pointer over the model and click the left mouse button, by completing this step the user is again allowed to move the model and place it anywhere in the application screen where the map is available.

- To place the first speed boat in the application screen, place the model on the location in the map.

- Click the left mouse button; note the speed boat is still attached to the mouse pointer to place the second speed boat on the location map click the left mouse button as shown in Figure 17.

- Press the Esc key to deselect the model.

- To manipulate the models heading as previously discussed press the up/down arrow keys located in the computer keyboard.

Note the default behavior parameter for all surface ships is military patrol craft; therefore the behavior needs to be changed for the two enemy speed boats. The explosive-laden behavior is assigned to the two speed boats. To the right of the map screen the model's information (SMAL metadata) is displayed while the model is selected. As previously discussed in the HVU model example this information can be modified to assign a behavior or role to the particular model, and so the next step is to assign the explosive-laden vessel behavior to this model.

- Place the arrow pointer in the model information screen; scroll down until the behavior parameter set is viewed in the screen.

- Under the Behavior parameter set there is a select box with the word type next to it, select the folder icon. Once the folder icon is selected a dialog box is displayed on the computer screen, it has a set of behavior libraries, select Savage tactics folder icon.
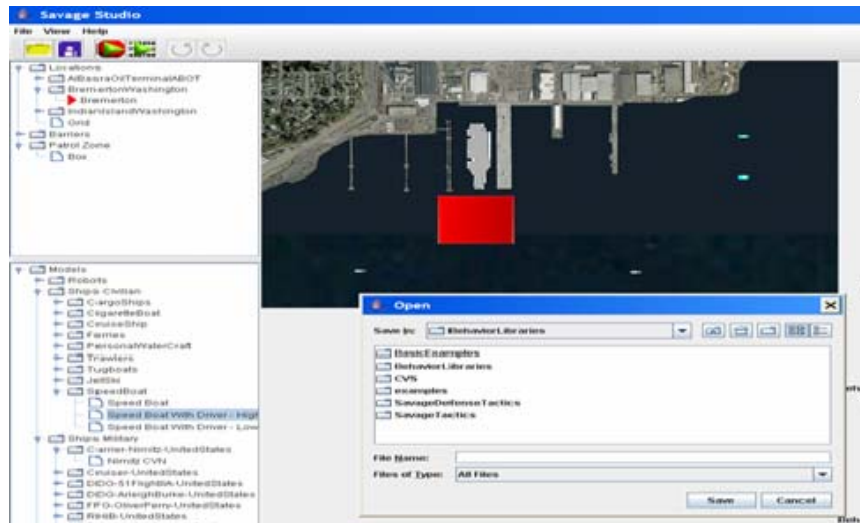
Figure 18.　　SavageStudio scenario-generation display window depicting a Nimitz class Aircraft Carrier, two added patrol boats and two speed boats and the behavior libraries selection box that is being assigned to the speed boats.

Once the folder icon is selected a dialog is displayed on the computer screen, it has a set of tactics, select the hostile folder icon.
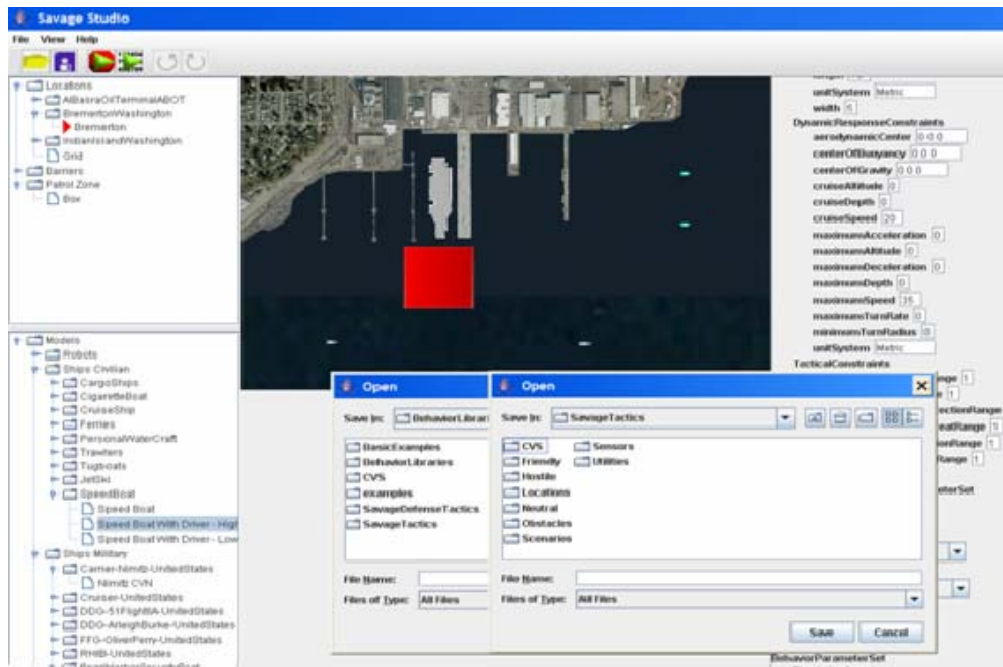
Figure 19.　　SavageStudio scenario-generation display window depicting a Nimitz class Aircraft Carrier, two added patrol boats, two speed boats, the behavior libraries selection box, and Savage Tactics behavior sub-folder that contains the behavior that is being assigned to the speed boats.
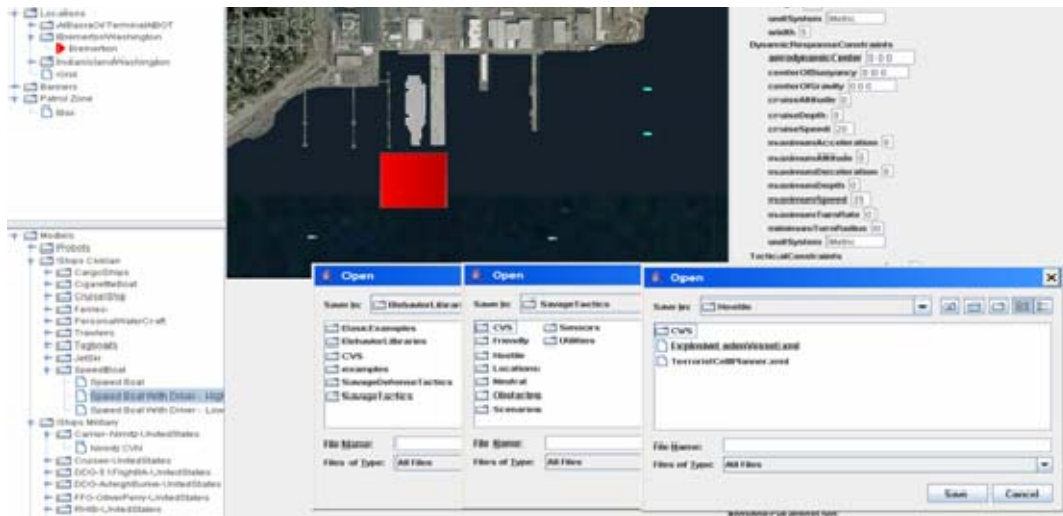
Figure 20.   SavageStudio scenario-generation display window depicting a Nimitz class Aircraft Carrier, two added patrol boats, two speed boats, the behavior libraries selection box, Savage Tactics behavior sub-folder and hostile behavior sub-folder that contains the behavior that is being assigned to the speed boats.

- Once the folder icon is selected a dialog box is displayed on the computer screen, it has a set of individual behavior tactics, select the ExplosiveLadenVessel.xml icon.

- Once the behavior is selected, click on the save button, the dialog box will close and the application will proceed to the model information screen.

After completion of the previous steps, the location and the desired entities have been placed in the scenario. The entity behaviors have been modified based on the user preferences, and the scenario is configured to be run either visually in 3D or off-screen for statistics.
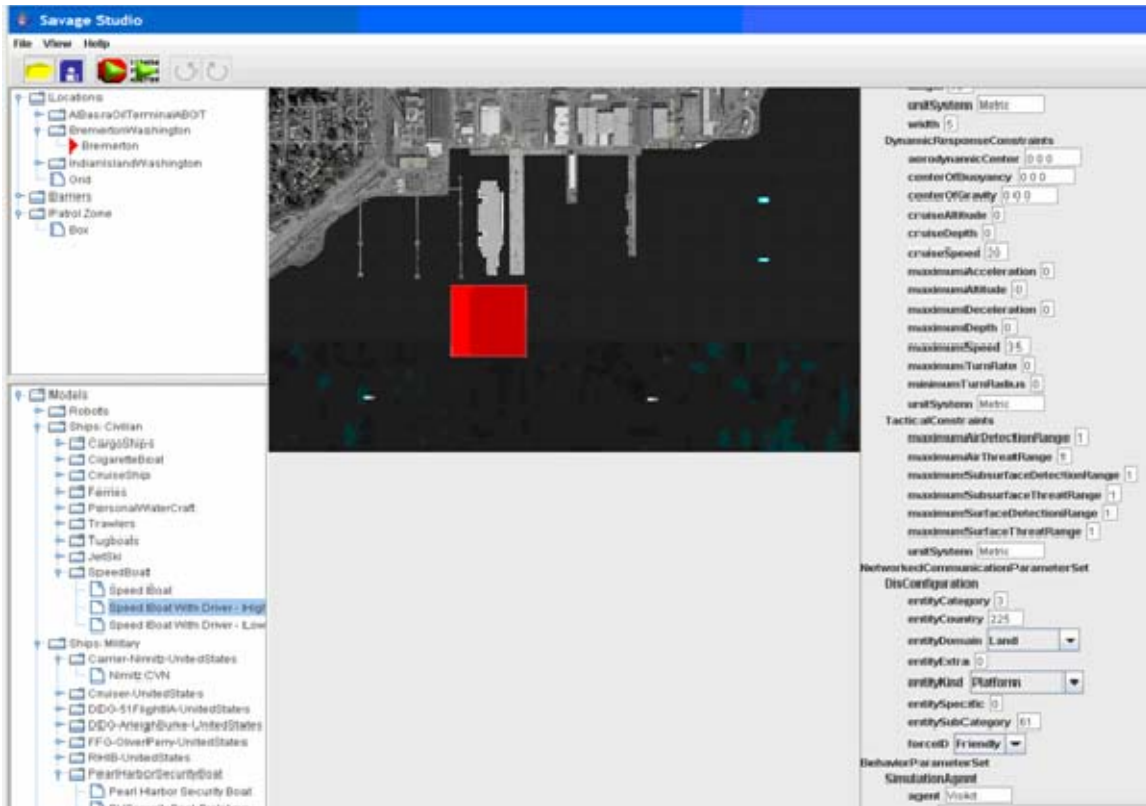
Figure 21.   SavageStudio scenario-generation display window depicting a fully configured scenario.

4.   Scenario-Execution Options

The user has two scenario-executing options available depending on what the user wish to gain from the simulation. The first execution option available to the user is the 3D view, which allows the user to accomplish specific tasks such as: visually inspect the entity behaviors and verify that the applied tactics are according to pre-planned responses, the user can view the simulation from the patrol boat point of view to experience what the patrol boat driver is receiving by visual sensors while the attack is taking place, the user can view the simulation from the explosive-laden vessel point of view to experience what the speed boat driver is receiving by visual sensors while the attack is being conducted. The user can view the scenario from any entity point of view

or from a top view (2D geographic view). In this way the user can gain visual insight to shortcomings on their defensive plans, or gain insight on the possible shortcomings on the terrorist attack plan.

The second execution option available to the user is the statistical view. This option allows the user that is no longer interested in visual feedback to run the scenario faster and to analyze only the statistical results. The user can iterate over thousands of simulations in a matter of seconds. Some of the tasks that can be accomplished from this statistical view are: modifying a defensive tactic and analyze what is the percentage of success (stopping the enemy given the new tactic employment), given a configured scenario execute the scenario one thousand times and see the percentage that the enemy was able to destroy the HVU (enemy success percentage), the user places different assets to protect the HVU and analyzes which asset is better given the current scenario configurations.

- To execute the scenario in a 3D view click on the green triangle inside the red circle icon located under the word help.

- A Save As dialog box appears on the computer screen, name and save the configured scenario as shown in Figure 22.
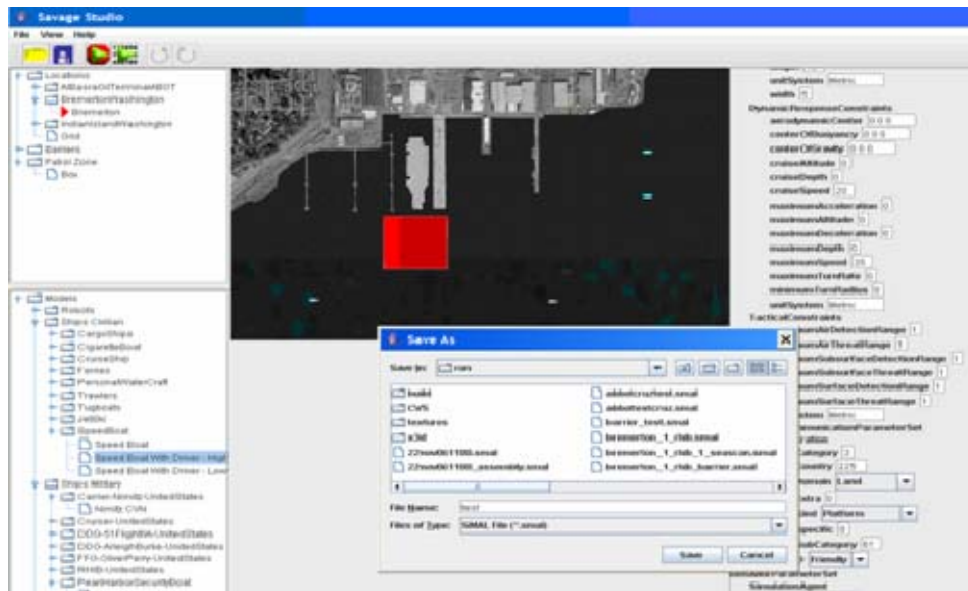
Figure 22.   SavageStudio scenario-generation display window depicting a fully configured scenario that is being saved to the scenario libraries.

- Once the scenario is saved, the application launches Viskit assembly runner and the simulation viewer.

- On the Viskit assembly runner screen, click on the gray box with a blue triangle inside it to start the simulation as shown on Figure 23.

- To execute the scenario for a statistical view, click on the green triangle inside the matrix icon located next to the 3D view icon.

- A save as dialog box appears on the computer screen, name and save the configured scenario as shown in Figure 23.

- Once the scenario is saved the application launches Viskit assembly runner.

- On the Viskit assembly runner screen, click on the gray box with a blue triangle inside it to start the simulation as shown on Figure 24.

- SavageStudio Viskit assembly runner display window is displayed with the simulation results on the right hand pane of the screen inside the Viskit assembly runner screen.
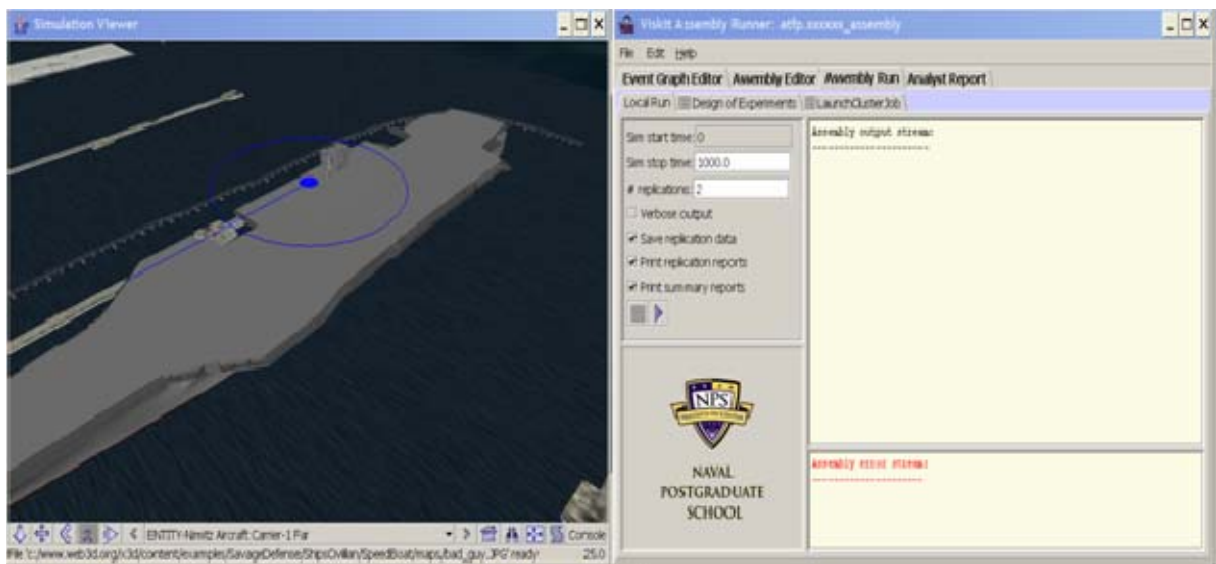
Figure 23.   SavageStudio simulation visual display window depicting a fully configured scenario in the left-hand window and the Viskit Assembly Runner in separate right-hand window.
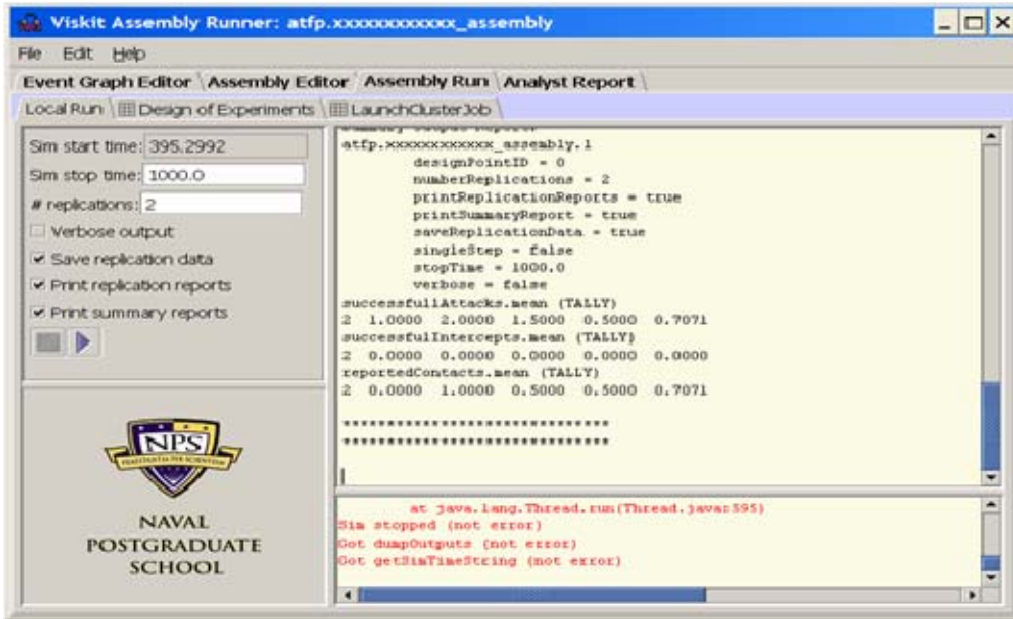
Figure 24.   SavageStudio Viskit Assembly Runner display window depicting the
execution of the fully configured scenario.

5.   Scenario Viewing Options

When the user executes the scenario in 3D viewing mode, the user has the ability
to view the running simulation from different points of view. The user can view the
scenario from any entity point of view or from a top view (2D geographic view) as
previously discussed. The user can navigate and explore the scene; the user can examine
the terrain, buildings, piers, ships and all the features available in the simulated 3D world.
This is accomplished by using different viewpoints accompanying each model and
created by the application.

Figure 25.   SavageStudio simulation viewing display window depicting a first-person view of the simulation from the explosive-laden vessel.

Figure 26.   SavageStudio simulation viewing display window depicting a fully configured scenario in the right hand window and first person view of the simulation from the explosive-laden vessel in the left hand window.

Figure 27. SavageStudio simulation viewing display window depicting detonation of the explosive laden vessel at the impact point.

D. LOADING A PREVIOUSLY CONFIGURED SCENARIO

Using SavageStudio, the user has the ability to both configure and save scenarios. These saved scenarios can be loaded at a later time for viewing, modification and analyst review. If the user wants to add another patrol boat to the previously configured scenario, the user does not need to start a new scenario from the beginning. The user loads a previously configured scenario and adds the new entities or new parameters that he wants to change to the new scenario; this feature saves the user time when minimal changes are required.

- To load a scenario from disk, the user launches SavageStudio once the application screen is loaded to the desktop, select the yellow folder icon.

- Once the folder icon is selected a dialog box opens on the computer screen, select the desired scenario and click on save.

- If the file loads satisfactorily the scenario configuration screen is automatically loaded with the desired scenario, further inspection of parameters and addition or detection of entries is permitted.

- If no changes are required then execute the simulation using the same steps as previously discussed.

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Figure 28.   SavageStudio scenario generation display window depicting scenario loading from the scenario run library.
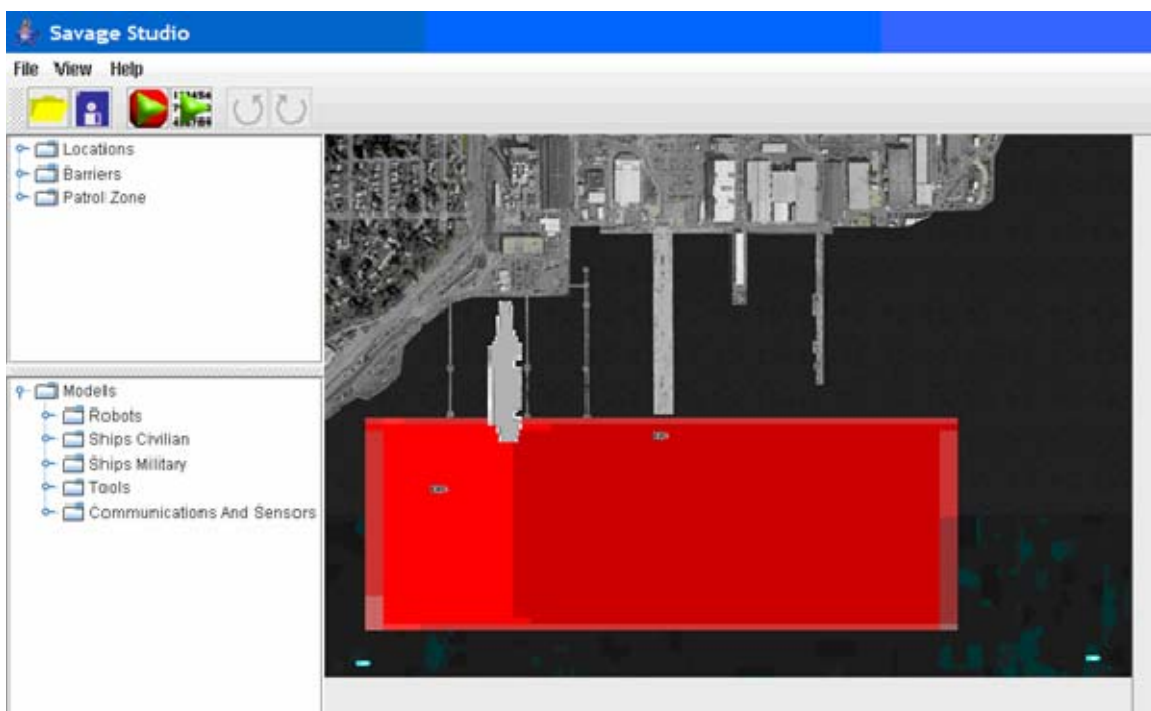
Figure 29.   SavageStudio scenario generation display window depicting a fully configured scenario loaded from the run library.

E.   SUMMARY

This chapter provided a step by step set of instructions for the creation of a scenario using SavageStudio. These steps included launching SavageStudio, creating a scenario, adding friendly and enemy forces, scenario execution, viewing the scenario and loading a previously configured scenario from disk.

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VI. RESULTS AND DISCUSSION

A. INTRODUCTION

This chapter provides an in-depth look at the two studies. Study I AT/FP Computer-based training versus Classroom instruction, and Study II Training effectiveness of the ATFP CBT with Simulation results and discussion. The chapter is divided in the following manner: Study I results and discussion then Study II results and discussion.

Descriptive statistics are used to compare and analyze the data obtained from both studies. Descriptive statistics describe the basic features of the data and this evaluation method enabled us to present the data in an unbiased way. This approach makes it possible to determine the likelihood that the differences within and between the participant groups were caused by the variables studied and not just by chance. All tests are graded on a scale 0-100.

B. STUDY I RESULTS

The analysis of the Pre-Test for both groups indicated that the CI students had a higher mean score than the CBT students. The CBT mean score was 50.55 and the CI mean score was 52.85. The analysis of the Post-Test for both groups indicated that the CBT students had a higher mean score than the CI students. The CBT mean score was 68.88 and the CI mean score was 60.71, resulting in net improvements of 18.33 and 7.86, respectively.

Figure 30.   Pre-test and post-test mean scores for the CBT and CI groups in study I.

The difference between the Pre-test and Post-test scores for the CI groups reveal that there is increase in performance between subjects after the training session was conducted. The difference between the Pre-test and Post-test scores for the CBT groups reveal that there is increase in performance between subjects after the training session was conducted.

The researcher conducted a two sample T-Test assuming equal variance with an alpha = 0.05 and 14 degrees of freedom. The T critical value found is $T_c = 2.144$ and the $T_0 = 1.306$ as shown on Table 5.

The difference between the Post-test scores for both the CBT and CI groups reveal improvement in performance after the treatment was conducted. However due to high variance in the data further statistical analysis revealed that there is no significant

difference in performance in regard to the delivery method after the training session. Therefore T critical value was not attained then we have to accept the Null hypothesis that $M_1 = M_2$.
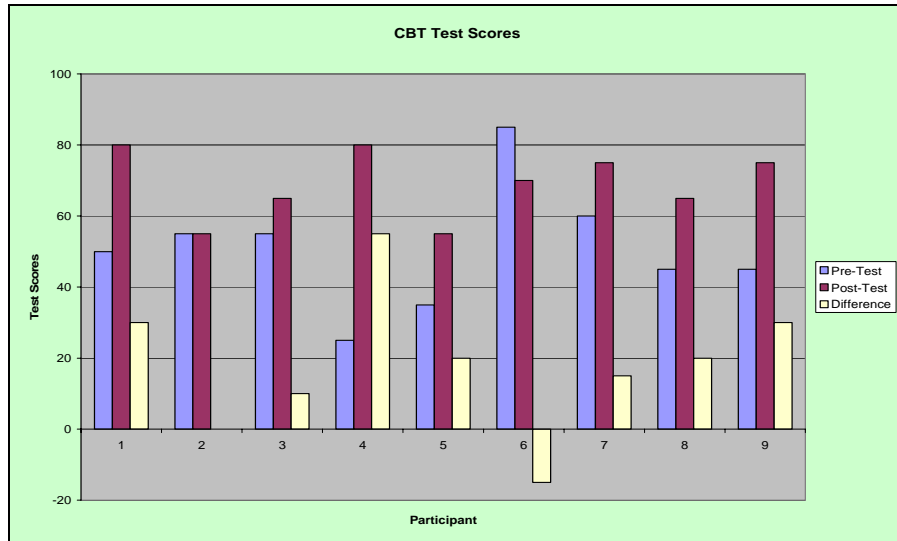
Figure 31.   CBT participant's exam scores for study I.
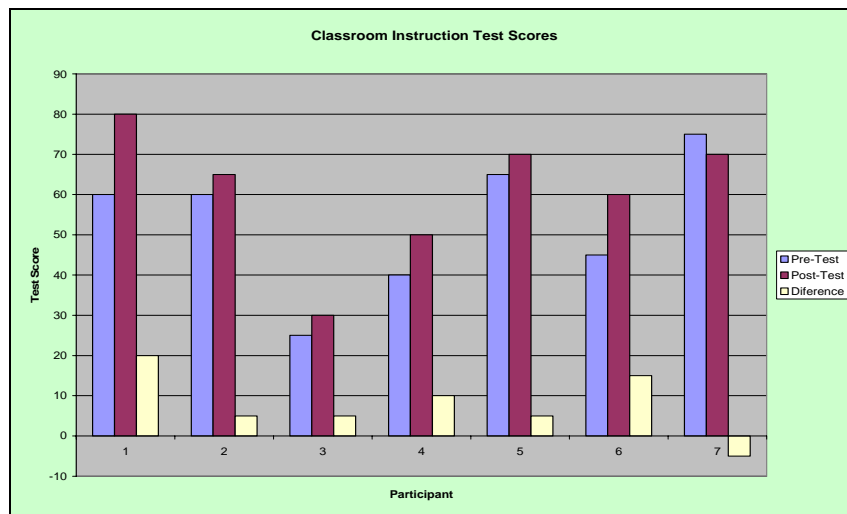
Figure 32.   CI participant's exam scores for study I.
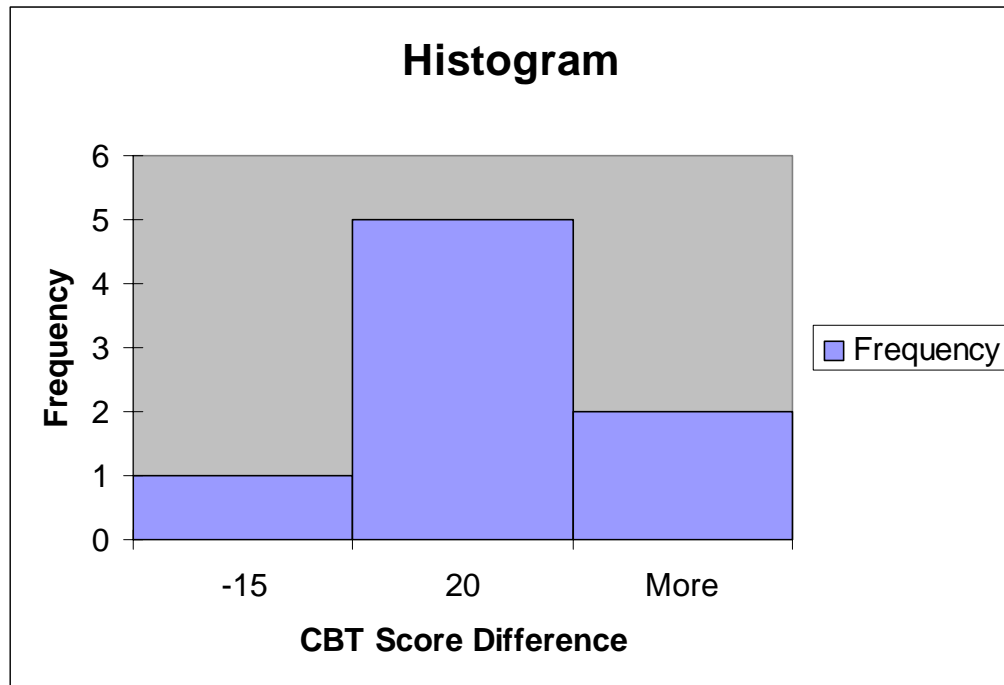
Figure 33.   Frequency distribution of student's pre/post-test scores difference for CBT participants.
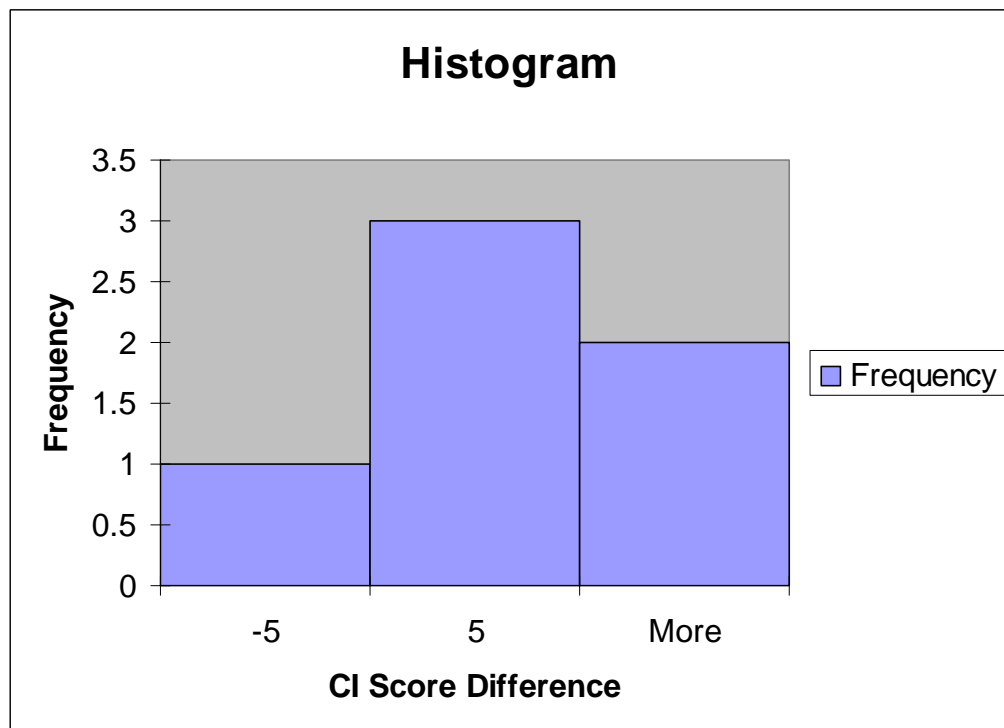
Figure 34.   Frequency distribution of student's pre/post-test scores difference for CI participants.

	CBT	Classroom
Mean	18.33	7.85
Variance	393.75	65.47
Observations	9	7
Pooled Variance	253.06	
Hypothesized Mean Difference	0	
Df	14	
t Stat	1.30	
P(T<=t) one-tail	0.10	
t Critical one-tail	1.76	
P(T<=t) two-tail	0.21	
t Critical two-tail	2.14	

Table 5.   Two Sample T-Test results equal variance table for study I.

C.   STUDY I DISCUSSION

The results show statistically significant improvement of the participant's performance on the tests after training for both CBT and CI. Despite the apparent higher scores improvement of students receiving the CBT instruction there was no statistically significant difference between the increases in performance based on the delivery method. Differences in performance improvement based on the delivery method, can be argued that for this research none is found due to the small sample of participants or variability of the participant's in the group. Nevertheless the results from the research given the circumstances mentioned and the literature research support the hypothesis that when the material presented is the same, CBT is as good as CI. The practical application is that results from this study support the continued present use and expanded future use of CBT by the U.S. Navy.

In many cases CBT is the best media because it allows easier access to the material. If it is on the Internet or on CD's at the worksite, then training can be done on a flexible, short notice basis, without need for lengthy scheduling. In addition to being more flexible, CBT requires less time, budget and facilities. Time savings include;

eliminating travel time, the ability to start and stop training and the ability to skip material already mastered. Budget savings include; costs to maintain classroom facilities, instructor's salaries, and students travel, lodging and lost work costs. Based on these advantages and increasing constraints on time and money, the implication is that similar training for the U.S. Navy may transition to CBT in the future.

D.   STUDY II RESULTS

The analysis of the pre-test and post-test score data for the group that received the AT/FP with simulation indicated that the post-test data scores are higher than pre-test data scores. The pre-test mean score was 41% and the post-test mean score was 84% a substantial increase in performance. The difference between the means after treatment is 43% illustrated in Figure 35.
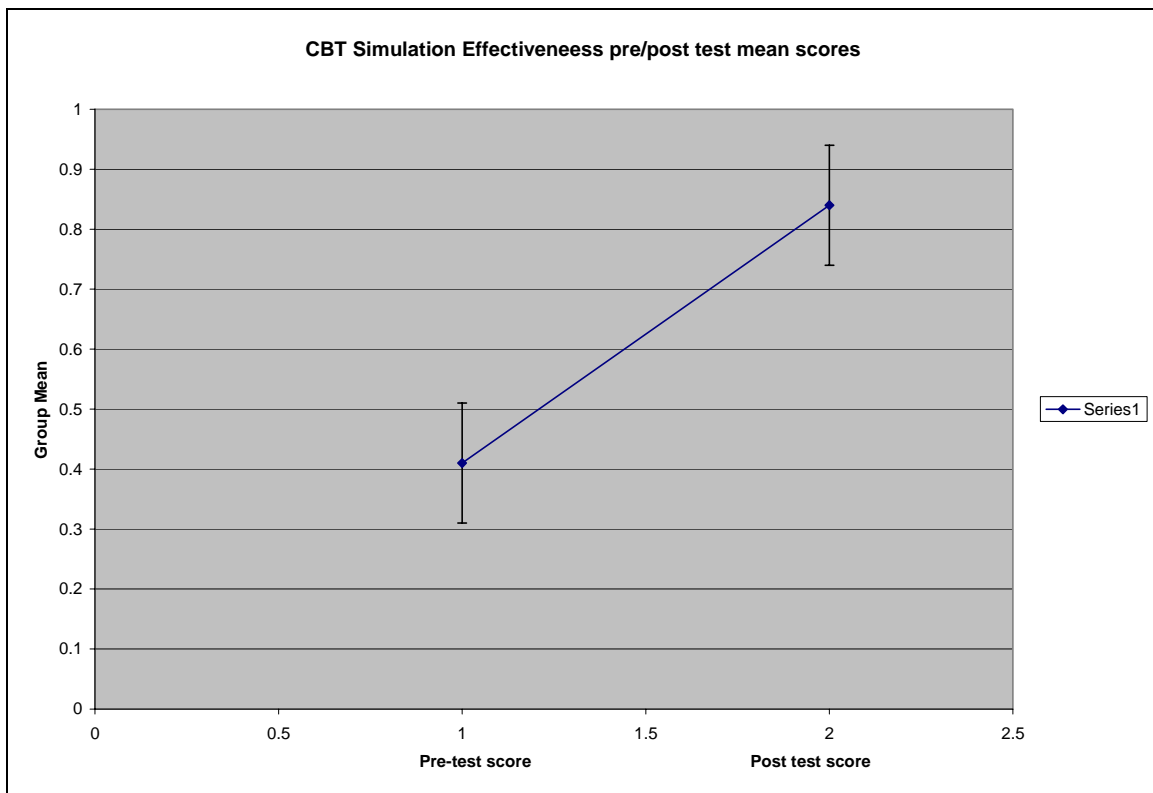
Figure 35.   CBT and Simulation pre/post-test mean scores for the participants for study II.
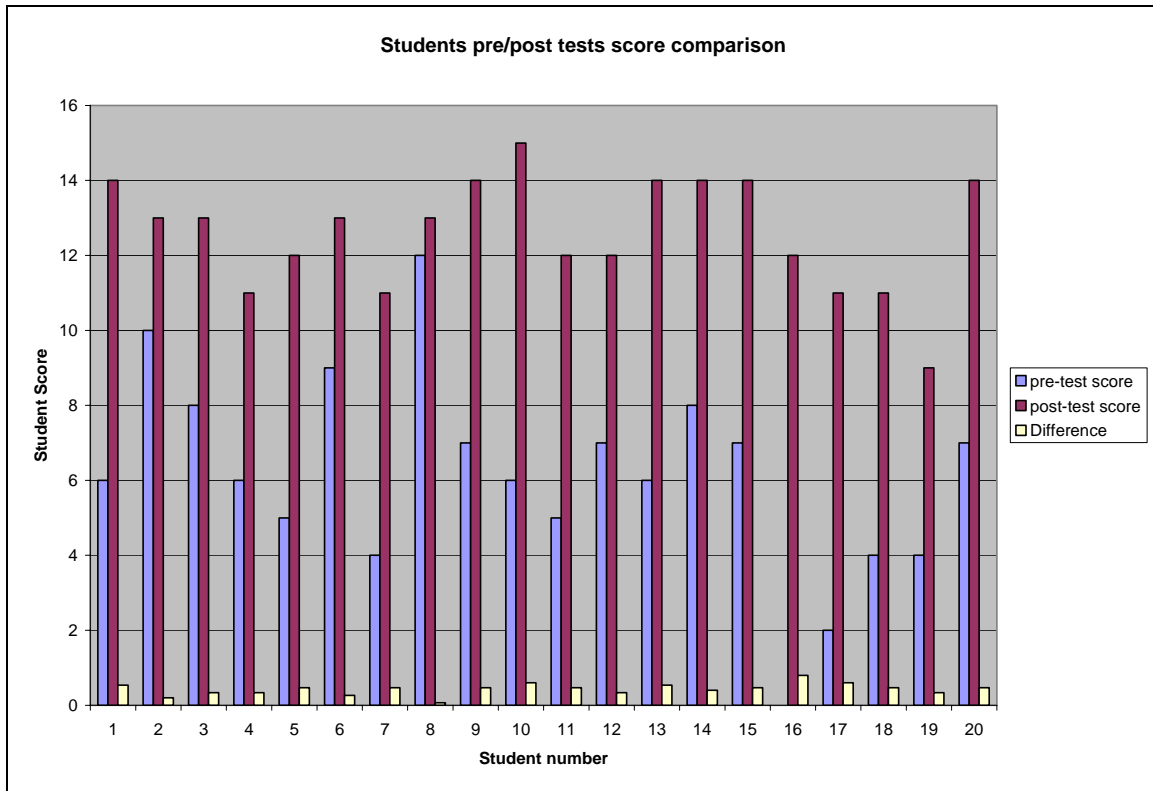
Figure 36.   Student's pre/post-test scores comparison for study II.
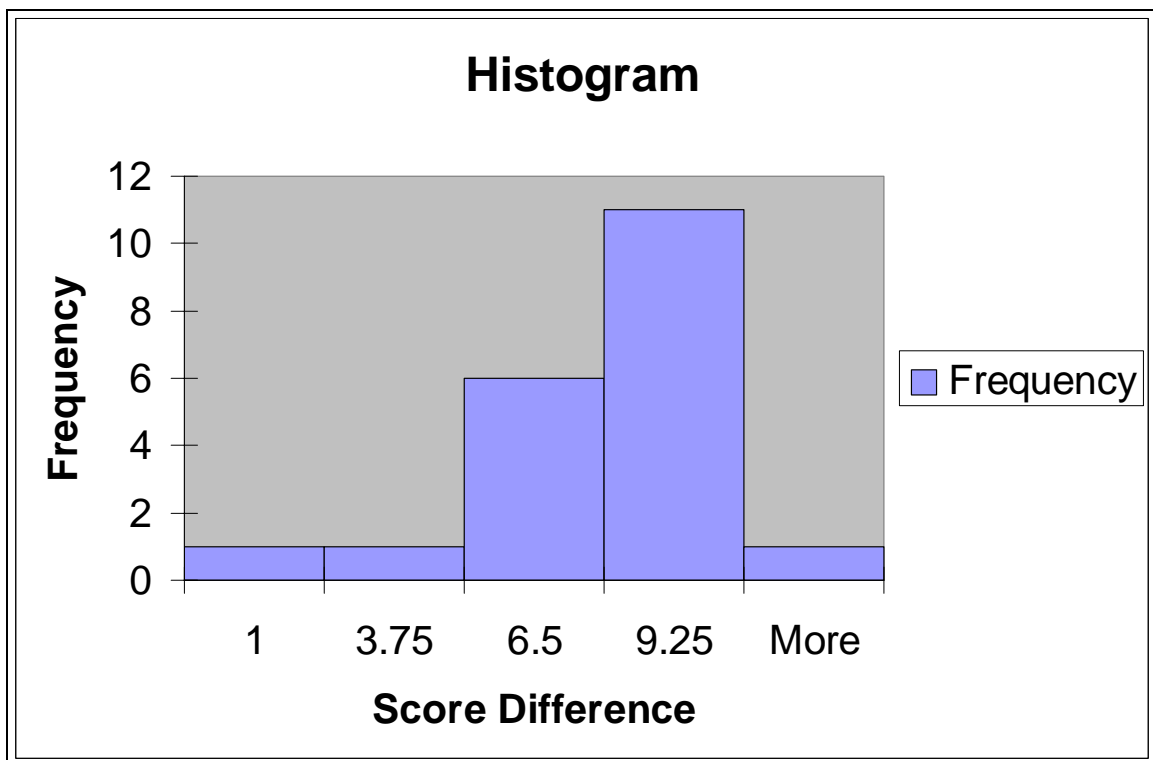
Figure 37.   Frequency distribution of student's pre/post-test scores difference for study II.

The difference between the pre-test and post-test scores for the group reveal that there is increase in performance between subjects after the training session was conducted. The difference between the pre-test and post-test scores can be attributed to the lesson provided for the students in the group.

A T-Test paired two sample for means test assuming equal variance was conducted with an alpha = 0.05 and 19 degrees of freedom. The T critical value is found to be $T_c = 2.09$ and the $T_0 = 2.07E\text{-}10$ (effectively zero) as shown in Table 6.

The difference between the pre-test and post-test scores for the group reveal that there is a significant difference in performance after the lesson was administered. Therefore the Null hypothesis that $M_1 = M_2$ is rejected and the alternative hypothesis is accepted.

	Variable 1	Variable 2
Mean	6.15	12.6
Variance	7.29	2.25
Observations	20	20
Pearson Correlation	0.483	
Hypothesized Mean Difference	0	
df	19	
t Stat	-12.15	
P(T<=t) one-tail	1.04E-10	
t Critical one-tail	1.72	
P(T<=t) two-tail	2.07E-10	
t Critical two-tail	2.09	

Table 6.   T-Test paired two sample for student's mean test result for study II.

The tasks completion for the scenario portion of the study measuring skill objectives using SavageStudio reveals that 20 of 20 participants completed the objectives with a score of 80% or better. 3 of the 20 participants achieved a score of 83% and the other 17 participants score 100% completing all assigned tasks. The scenario task completion mean score is 97.5%.

subject	asseesment zone established	warning zone established	threat zone established	ID critical assets	Id vulnerabilites	Observe the scenario and explain results	score	% per Student
				Tasks				
1	1	1	1	1	1	1	6	1
2	1	1	1	1	1	1	6	1
3	1	1	1	1	1	0	5	0.83
4	1	1	1	1	1	0	5	0.83
5	1	1	1	1	1	1	6	1
6	1	1	1	1	1	1	6	1
7	1	1	1	1	1	1	6	1
8	1	1	1	1	1	1	6	1
9	1	1	1	1	1	1	6	1
10	1	1	1	1	1	1	6	1
11	1	1	1	1	1	1	6	1
12	1	1	1	1	1	1	6	1
13	1	1	1	1	1	1	6	1
14	1	1	1	1	1	1	6	1
15	1	1	1	1	0	1	5	0.83
16	1	1	1	1	1	1	6	1
17	1	1	1	1	1	1	6	1
18	1	1	1	1	1	1	6	1
19	1	1	1	1	1	1	6	1
20	1	1	1	1	1	1	6	1
Score per Objective	20	20	20	20	19	18		
% per Objective	1	1	1	1	0.95	0.9		0.975

Table 7.   Student's objective completion results using SavageStudio in Study II.

E.   STUDY II DISCUSSION

The results show statistically significant improvement of the participant's performance on the specified post-tests after training was conducted. The performance improvement can be attributed to the lesson and the scenarios completed between tests. Results from the study and previous research on the subject support the findings that scores on post-test will be different than scores on the pre-test, if a treatment is provided to the group in this case the AT/FP lesson and scenario. The practical application for this study is that this research can be used to support future research where CBT and simulation effectiveness can be compared with CI effectiveness.

If future research finds that CBT and simulation is as effective as classroom instruction then future research ought to be conducted on the effectiveness and deployment of such systems for future Navy training.

F.   SUMMARY

This chapter provides an in-depth look at the two studies, study I (AT/FP Computer-based training versus Classroom instruction) and Study II (Training effectiveness of the ATFP CBT with Simulation) results and discussion. Results for study

I showed that there is no significant difference between CBT and CI if the content is the same. Results for study II showed that there is a difference in post-test scores after treatment is applied to a group (AT/FP lesson and simulation).

VII. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSIONS

This thesis was motivated by the needs of the Navy in a period where Anti-Terrorism and Force Protection Training is a must, time and resources are scarce, and the Navy's number-one priority is to train its sailors in an efficient manner. The enemies of the U.S. recognize that terrorism will continue to create problems for U.S. Forces worldwide, and the use of terrorist tactics will continue to be used in the future by these groups.

The result of this research can help future development of CBT and simulation training systems by demonstrating a formal methodology to accomplish organizational requirements. The research conducted provided an in-depth look at the analysis, design, development, implementation and evaluation of the developed lessons for the AT/FP course using the ISD framework. The use of the ISD in the creation process of a CBT is imperative if successful, meaningful instruction is required. The CBT developed for this thesis research incorporated multimedia and simulation to enhance the knowledge gain and knowledge transfer. Future developers should remember Clark's (1994) theory that well developed instruction is the most important aspect of training, more than the delivery method itself, and not let themselves fall in the trap to add more bells and whistles just for the sake of "coolness" if the content of the instruction is not well designed, then no matter what delivery method is used the instruction will not achieve its objectives.

The results for the first study showed that there is no statistically significant difference between CBT and CI if the content is the same. Results for study II showed that there is a difference in post-test scores after treatment is applied to a group (AT/FP lesson and simulation). This research study supports the theory that CBT is a viable alternative to CI, and also supports the hypothesis that CBT and Simulation improves user learning and performance. These results support Clark's (1994) theory, stated in the introduction, that media does not affect learning if the content of the instruction is the

77

same. Thus both this research and the literature, namely Greitier (2002) and Sitzmann et. al (2006) support the theory that performance can be effectively increased using either type of instruction delivery method.

Results and research also support the Navy's vision of the Training Revolution (Executive Review of Navy Training 2001). Leaders face budget and operational time constraints that force them to work in unconventional ways to accomplish the Navy's mission. Computer-Based Training and Simulation is one of the unconventional approaches that offer several advantages for the military organization. Such type of training offers leaders savings on resources, time and money. The necessary supporting technological infrastructure is already in place on Navy ships and sore bases. The goal of CBT is not to eliminate Classroom Instruction altogether but, rather to supplement it or make available the instruction to the sailor when other methods are not available.

The CBT developed for this thesis research incorporated multimedia and X3D graphics simulation to enhance the knowledge gain and knowledge transfer.

B.   RECOMENDATIONS FOR FUTURE WORK

1.   Human in the Loop for Training

During the execution of this thesis research, agent and security postures during scenario creation and execution were not modifiable, and so the participant was only able to select behaviors or security postures from the Savage libraries. It is recommended that mission decision points be added to SavageStudio scenarios where the user has the ability to manipulate agent actions or modify security postures at critical decision points, then let the simulation execute and see the results of the user decisions. This feature allows the user to further exercise course of action and planning skills. During the execution of this thesis research the SME observed the participant's actions during scenario creation and execution and listened to the participant's verbal explanation of his actions. The SME collected the participant's information by annotating the information in a notebook for later debrief and feedback on the user performance. It is recommended that feedback screens and replay options be provided to the instructor allowing him to go over the user decisions and use the features to provide feedback and teaching points to the user. During

the execution of this thesis research information was provided to the participant using paper created documents referenced in Appendix J thru Appendix M. It is recommended that information be provided to the user by creating a tab section during scenario creation that contains the following information: Commanding Officer's Guidance tab, ATO Mission Objectives tab, Threat Assessment tab and Intelligence Briefs tab.

These tabs can be updated as the simulation is executed, for example, new intelligence information is made available to the user, so that the user may change force protection posture based on the new intelligence.

2. Expand the Behavior Libraries

It is recommended that the SavageStudio be enhanced by authoring additional behavior libraries to include the following behaviors:

      1. Ship's personnel responses against low slow flyer.

      2. Ship's security force personnel responses against swimmer attack.

      3. Security boat responses against swimmer attack.

      4. Hostile swimmer attack behavior.

3. Migrate SavageStudio Application for Shore Facilities

It is recommended that the approach and framework used in SavageStudio be migrated to shore facilities for the protection of high value assets in land. The technologies used in the creation for SavageStudio are well suited for similar AT/FP applications for shore facilities. Representation of shore and land facilities can be created with technology being researched by the Savage Group at the Naval Postgraduate School. The behavior libraries can be easily modified and adapted to behaviors used in AT/FP of land facilities.

4. Design of Experiments (DOE)

In order to test specific variable effects when conducting risk and cost assessment there exists a need to keep all variable effects constant except for the tested variables. Currently some of the algorithms used in SavageStudio use stochastic processes which

use probabilistic methods to generate states in the simulation. While this is good for course of action and training applications, the additional ability to only modify one variable at a time is good for testing risk assessment. For example, if a friendly defense posture is maintained constant and the departure of the explosive laden vessel constant, the user can modify the location of security assets between runs, and then the analyst can determine if the modification of location of these assets benefited or hampered a given defense plan.

5.   Mission Playback

In order to provide trainees with feedback there is a need to add a mission playback feature, so that either instructor or trainees can go back and review specific decision points during the simulation execution.

6.   Larger Sample Size

It is recommended that this study be replicated with a larger sample size and true random assignment to treatment groups. Future research that builds on Clark's theory testing varying levels of complexity of the material presented. There may be a point where CBT and CI do not perform equally, and indeed a well-designed CBT might outperform CI, as indicated in Study I. Maximizing CBT effectiveness deserves serious efforts since the potential payoffs are so significant.

APPENDIX A.   TASK ANALYSIS FOR SAMPLE LESSON 2 OF THE ATO LEVEL II COURSE USING CBT AND X3D GRAPHICS

Task Analysis:
The following task analysis identifies the required tasks that the user will be expected to perform after completion of the lesson.

Training Objectives:

Course training objective 2.0:
Develop and implement Pre-Planned Responses that will be effective mechanisms to detect, deter, defend and mitigate likely terrorist threats against U.S. Navy assets and installations.

Course training objective 3.0:
Assess the anti-terrorism environment, situation for an afloat command, given current contingencies and sources of information.

The learning objectives that will be measured will be knowledge and skill based objectives.

Learning objectives:

2.1   Define the importance of the Defense in Depth concept in accordance with Navy Tactics, Techniques and Anti-terrorism/Force Protection procedures and apply this concept to ship in-port security. (Knowledge) Performance data for this objective will be collected in the post-test.

2.2a   Define the principles of the Defense in Depth concept in accordance with Navy Tactics, Techniques and Procedures Anti-terrorism/Force Protection and apply this concept to ship in-port security scenario. (Knowledge) Performance data for this objective will be collected in the post-test.

2.2b   Use the SavageStudio in visual mode to explain the principles of defense in depth. (Knowledge) Performance data for this objective will be collected using the SavageStudio, student will explain the defense in depth concept as it applies to the scenario.

2.2c   Use the SavageStudio in visual mode to assess and demonstrate the application of the principles of defense in depth as they occur in a scenario. (Skill) Performance data for this objective will be collected using the SavageStudio, student will assess the scenario situation and will demonstrate the application of the defense in depth principles by the correct placement of assets as it applies to the scenario.

2.3a   Define the Assessment, Warning and Threat Zones as used in the anti-terrorism program. (Knowledge) Performance data for this objective will be collected in the post-test.

2.3b   Use the SavageStudio visual mode to demonstrate the assessment, warning and threat zones as used in the anti-terrorism program concept of defense in depth. (Knowledge) Performance data for this objective will be collected using the SavageStudio, student will explain or address the 3 zones as they apply to the scenario.

2.3c   Use the SavageStudio in visual mode to demonstrate the application of the Assessment, Warning and Threat Zones as used in the anti-terrorism program. (Skill) Performance data for this objective will be collected using the SavageStudio, student will demonstrate or identify the 3 zones as they apply to the scenario.

2.4a   Define the purpose of pre-planned responses in accordance with Navy Tactics, Techniques and Anti-terrorism/Force Protection and NTTP 3-07.2.1 (Rev A). (Knowledge). Performance data for this objective will be collected in the post-test.

2.4b   Define the likely terrorist threats by applying the pre-planned responses concept in accordance with Navy Tactics, Techniques and Procedures Anti-terrorism/Force Protection. (Knowledge) Performance data for this objective will be collected in the post-test.

2.5a   Use the SavageStudio in visual mode to identify critical assets, and vulnerabilities for the NAVSTA scenario. (Knowledge) Performance data for this objective will be collected using the SavageStudio, describe and explain the assessment of the environment and situation, the student will explain potential threats and vulnerabilities as they apply to the scenario.

2.5b,   Use the SavageStudio in visual mode to explain the anti-terrorism environment and situation; using the X3D visual scene of the generated scenario explain the force protection employment of assets to protect given critical assets while minimizing vulnerabilities. (Skill) Performance data for this objective will be collected using the SavageStudio, the student will identify potential threats and vulnerabilities as they apply to the scenario.

Task 1:
At the end of task 1 the user will be expected to:
1. Complete the pre-test

Task 1. Complete the Pre-Test:
        1.1 Complete 20 question test.
        1.2 Inform the instructor of pre-test completion.

Task 2:
At the end of task 2 the user will be expected to:
1. Be able to answer questions and state the purpose of Defense in Depth.
2. Be able to answer questions and describe the principles of Defense in Depth.
3. Be able to answer questions and describe the Assessment, Warning and Threat Zones.
4. Be able to answer questions and describe the purpose of pre-planned responses.
5. Be able to answer questions and describe the likely terrorist threats for developing
    pre-planned responses.

Task 2. Complete the CBT portion of the lesson:
        2.1 Load the CBT lesson in the computer.
        2.2 Launch the AT/FP CBT course using the mouse.
        2.3 Select lesson 2 from the CBT menu.
        2.3 Start the lesson.
        2.4 Observe and listen to the lesson.
        2.5 Once the lesson is completed, contact the SME for further instructions.

Task 3:
At the end of task 3 the user will be expected to:
1. Use SavageStudio in visual mode to assess the anti-terrorism environment and situation, using visual scene of port maps to identify critical assets and vulnerabilities.
2. Use SavageStudio in visual mode to describe the principles of defense in depth as they occur in a scenario.
3. Use SavageStudio in visual mode to describe the assessment, warning and threat zones.
4. Use SavageStudio in visual mode to exercise pre-planned responses.
5. Set up defense in depth for the NAVSTA scenario and list and observe the pre-planned responses for boat-born IED.

Task 3. Use SavageStudio to generate and execute a scenario:
        3.1 Read the scenario information given by the instructor.
        3.2 Identify critical assets and vulnerabilities.
        3.3 Prioritize identified critical assets.
        3.4 Select location to place critical assets for maximum security.
        3.5 Set up defense in depth using patrol boxes, patrol boats, radars and barriers.
            3.5.1 Place the patrol box within the chosen harbor.
                3.5.1.1 Assign the friendly asset to the patrol zone.
            3.5.2 Modify the patrol zone dimensions.

3.5.3 Place barriers within the chosen harbor.

3.5.4 Place radar assets within the chosen harbor.

3.5.5 Repeat task 3.5.1 for a second friendly asset (patrol boat).

3.6 Execute the scenario using the visual mode.

3.7 Navigate the scene using the viewpoint button.

3.7.1 Observe patrol boat pre-planned response.

3.7.1.1 Observe patrol boat intercept unauthorized vessels.

3.7.1.2 Observe patrol boat shoulder unauthorized vessels.

3.7.1.3 Observe patrol boat or SSDF engage unauthorized vessel with destructive fire.

3.8 Launch and review the analyst report.

3.9 Analyze threat and simulation parameters using the analyst report.

3.9.1 Determine patrol boat interceptions.

3.9.2 Determine enemy success percentage.

3.9.3 Determine if use of assets was optimized.

3.10 Develop friendly courses of action based on statistical results from the simulation.

Task 4:

At the end of task 4 the user will be expected to:

1. Complete the post-test

Task 4. Complete the Post-Test:

4.1 Complete 20 question test.

4.2 Inform the instructor of post-test completion.

APPENDIX B.   LESSON-ENABLING OBJECTIVES

LESSON-ENABLING OBJECTIVES

1.   Enabling Objectives that will Accomplish the Second Learning Objective

1. Use the SavageStudio visual mode to describe the principles of defense in depth as they occur in a scenario.

2. Use the SavageStudio visual mode to describe the assessment, warning and threat zones as used in the anti-terrorism program concept of defense in depth in accordance with Navy Tactics.

3. Use the SavageStudio visual mode to describe the Naval Vessel Protection Zone in accordance with Navy Tactics.

4. Use the SavageStudio visual mode to describe the purpose of pre-planned responses in accordance with Navy Tactics.

5. Use SavageStudio to analyze course of action (COA) development and implementation of Pre-Planned responses, identification of critical assets, identification and quantification of threat, assessing asset vulnerability, assessing risk and developing countermeasures.

6. Use the SavageStudio visual mode to compare and select COA in accordance with Navy Tactics.

2.   Enabling Objectives that will Accomplish the Third Learning Objective:

1. Use the SavageStudio to visual mode to assess the anti-terrorism environment and situation, using visual scene of port maps to identify critical assets and vulnerabilities.

2. Set up defense in depth for the NAVSTA scenario and list and observe the pre-planned responses for boat-born IED.

3. **Enabling Objectives that will Accomplish the Fourth Learning Objective:**

1. Use the SavageStudio visual mode to analyze COAs that will be used in the development of the AT/FP plan.

APPENDIX C.   MEDIA SELECTION

The methodology used in media selection is described below for knowledge-based objectives and skill-based objectives. The process was repeated for each objective to select the most effective media delivery method.

A.   KNOWLEDGE-BASED OBJECTIVE

1. Define the objective

    Define the importance of defense in depth

2. Classify the objective

    Facts about defense (declarative knowledge objective)

3. Strategy

    List and explain important reasons

4. Media Delivery

    Classroom lecture, CBT, textbook, audio visual

5. Content

    List, narrative explanation, case examples

6. Performance Measurement

    Score on written test, instructor evaluation

B.   SKILL-BASED OBJECTIVE

1. Define the objective

    Assess and demonstrate the application of defense in depth as it occurs in a scenario

2. Classify the objective

    Tactical concepts about defense in depth (skill objective)

3. Strategy

>   List and explain operating procedures, show how to implement DID (process)

>   Demonstrate correct threat ID, set defenses IAW with threat assessment, operate the SIM and execute plan, analyze results then correct tactical planning and execute changes

4. Media Delivery

>   Classroom lecture, Scenario and Simulation

5. Content

>   Narrative explanation, procedure case examples

6. Performance Measurement

>   SME evaluation

>   System statistical tally

APPENDIX D.   STORYBOARD FOR TRAINING AND CLASSROOM INSTRUCTION COMPARISON STUDY

CENTER FOR SECURITY FORCES

Introduction to Terrorism
Lesson Topic
1.0

1-2-1

Presentation Details:
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
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Name:

Slide 1

Slide 1
Duration: 00:00:25
Advance mode: Auto

CENTER FOR SECURITY FORCES

Introduction to Terrorism
Lesson Topic
1.0

1-2-1

Terrorism is nothing new, its deadly acts have been around for hundreds of years and acts of terrorism against Americans and other nations will continue for many years to come. Unfortunately for the innocent, terrorist of today are becoming more innovative in the carrying out of their deadly acts. The end result are scenes of massive carnage.

Slide 2

Slide 2
Duration: 00:00:05
Advance mode: Auto

References

- DOD O-2000.12-H
- NWP 3-07.2.
- 9-11 Commission Report
- USATRADOC DCINST No. 1, Version 3.0

1-2-2

References for this lecture were taken from the following sources:

Slide 3

Slide 3
Duration: 00:00:10
Advance mode: Auto

Enabling Objectives

- DEFINE terrorism
- IDENTIFY the categories of terrorist organizations
- DESCRIBE types of terrorist training

1-2-3

No notes for this slide

Slide 4 🔊 **Slide 4** Duration: 00:00:17 Advance mode: Auto	**Enabling Objectives** • IDENTIFY the general characteristics of a terrorist operation • LIST the seven phases of a terrorist operation • DESCRIBE common terrorist attacks • DESCRIBE the types of terrorist threats • DESCRIBE the future trend of terrorism 1-2-4
No notes for this slide	
Slide 5 🔊 **Slide 5** Duration: 00:00:18 Advance mode: Auto	**DoD Definition of Terrorism** "The calculated use of unlawful violence or threat of unlawful violence to inculcate fear; intended to coerce or intimidate governments or societies in the pursuit of goals that are generally political, religious, or ideological." 1-2-5
You will take command at a time in which events combine to make terrorism a top national security concern. Since the Beirut bombing in 1983, the U.S. military has suffered more casualties to terrorism than in combat operations. At a time when its military strength is unmatched as the world's remaining superpower, the United States is committed to more unfamiliar environments than at any time in its history due to widespread political instability around the world. Rogue state and sub-state opponents of U.S. policy cannot challenge U.S. military power directly, but they can and do attack vulnerabilities of U.S. Forces in an effort to erode military effectiveness and morale. Definition of Terrorism Terrorism has always been difficult to define. Even within the U.S. Government, different departments adhere to different definitions. The DoD defines terrorism as "The calculated use of violence or threat of violence to inculcate fear; intended to coerce or to intimidate governments or societies in the pursuit of goals that are generally political, religious or ideological".	

Slide 6 🔊	**Common Elements of Terrorism**
Slide 6 Duration: 00:00:36 Advance mode: Auto	• Political • Psychological • Violent • Dynamic • Deliberate 1-2-6

Elements of Terrorism:
The definition in the previous slide is clear and comprehensive. It contains the three elements that should be included in any definition of terrorism:
1. Political - Clausewitz' statement that "war is a continuation of policy by other means" is taken as a truism by terrorists.
2. Psychological - The intended result is to create a psychological
Terror
3. Violent- Violence, coercion, and destruction are used in the commission of the act to produce the desired effect
4. Dynamic - Terrorist groups demand change, revolution or political movement.
5. Deliberate - Terrorism is an activity planned and intended to achieve particular goals.

Slide 7 🔊	**Categories of Terrorist Organizations**
Slide 7 Duration: 00:00:10 Advance mode: Auto	• Government affiliation categories • Motivation categories • Ideological categories 1-2-7

These topics will be discussed in the next few slides:

Slide 8

Slide 8
Duration: 00:00:30
Advance mode: Auto

Government Affiliation

- Non-state supported
- State supported
- State directed

1-2-8

Non-state supported. These are terrorist groups that operate autonomously, receiving no significant support from any government.
• State-supported. These are groups that generally operate independently but receive support from one or more governments.
• State-directed. These groups operate as an agent of a government and receive substantial intelligence, logistic, and operational
support from the sponsoring government.

Slide 9

Slide 9
Duration: 00:01:35
Advance mode: Auto

Motivation Categories

- Separatist
- Ethnocentric
- Nationalistic
- Revolutionary

1-2-9

Separatist. Separatist groups are those with the goal of separation from existing entities through independence, political autonomy, or religious freedom or domination. The ideologies separatists subscribe to include social justice or equity, anti-imperialism, as well as the resistance to conquest or occupation by a foreign power.
• Ethnocentric. Groups of this persuasion see race as the defining characteristic of a society, and therefore a basis of cohesion. There is usually the attitude that a particular group is superior because of its inherent racial characteristics. Examples: KKK, Aryan Nation, Black Panthers,
• Nationalistic. The loyalty and devotion to a nation, and the national consciousness derived from placing one nation's culture and interests above those of other nations or groups is the motivating factor behind these groups.
This can find expression in the creation of a new nation, or in splitting away part of an existing state to join with another that shares the perceived "national" identity.
• Revolutionary: These groups are dedicated to the overthrow of an established order and replacing it with a new political or social structure. Although often associated with communist political ideologies, this is not always the case, and other political movements can advocate revolutionary methods to achieve their goals.

Slide10
Choices
Interaction type: Choices
Passing score: 60
Instructions: None
Custom Message: None

Learning Game Placeholder
Learning Game: Choices
Title: Choices

Questions
1. The following elements are essential in the definition of terrorism in accordance to the Department of Defense:
violence or threat of violence, fear, coercion, pursuit of goals
1) True (Correct)
2) False

2. Which is a category of terrorist organization?
1) government affiliated (Correct)
2) state directed
3) separatist
4) anarchist

3. Which is a characteristic of a government affiliated terrorist organization?
1) state support (Correct)
2) violence fear
3) anarchist
4) IED

Slide 11
Slide 11
Duration: 00:00:06
Advance mode: Auto

_____**Ideological**_____

- Political
- Religion
- Social

1-2-11

Ideological categories describe the political, religious, or social orientation of the group.

Slide 12

Slide 12
Duration: 00:00:52
Advance mode: Auto

Political

- Right Wing
- Left Wing
- Anarchist

1-2-12

Right wing: These groups are associated with the reactionary or conservative side of the political spectrum, and often, but not exclusively, are associated with fascism or neo- Nazism.
Left wing: These groups are usually associated with revolutionary socialism or variants of communism.
Anarchist: Anarchist groups are anti-authority or anti-government, and strongly support individual liberty and voluntary association of cooperative groups.

Slide 13

Slide 13
Duration: 00:00:13
Advance mode: Auto

Religious

1-2-13

Religiously inspired terrorism is on the rise, with a forty-three percent increase of total international terror groups espousing religious motivation between 1980 and 1995. While Islamic terrorists and organizations have been the most active, and the greatest recent threat to the United States, all of the major world religions have extremists that have taken up violence to further their perceived religious goals. Religiously motivated terrorists see their objectives as holy writ, and therefore infallible and non-negotiable. Religious motivations can also be tied to ethnic and nationalist identities, such as Kashmiri separatists combining their desire to break away from India with the religious conflict between Islam and Hinduism. The conflict in Northern Ireland also provides an example of the mingling of religious identity with nationalist motivations. There are frequently instances where groups with the same general goal, such as Kashmiri independence, will engage in conflict over the nature of that goal (religious or secular government).Christian, Jewish, Sikh, Hindu and a host of lesser known denominations have either seen activists commit terrorism in their name, or spawned cults professing adherence to the larger religion while following unique interpretations of that particular religion's dogma. Cults that adopt terrorism are often apocalyptic in their worldview, and are highly dangerous and unpredictable. It is interesting to note that religiously motivated terrorists are among the most energetic developers of Weapons of Mass Destruction (WMD) for terrorist use. Also, religiously inspired cults executed the first confirmed uses of biological and chemical nerve agents by terrorists.

Slide 14

Slide 14
Duration: 00:00:17
Advance mode: Auto

Social

Pro-Life
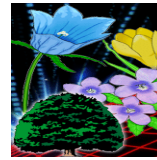
Earth Liberation Front (ELF)

Pro-Choice

Animal Rights Groups

Often particular social policies or issues will be so contentious that they will incite extremist behavior and terrorism. Frequently this is referred to as "single issue" or "special interest" terrorism. Some issues that have produced terrorist activities in the United States and other countries are:
• Animal rights
• Abortion
• Ecology/environment
• Minority rights

Slide15

Choices
Interaction type: Choices
Passing score: 80
Instructions: None
Custom Message: None

Learning Game Placeholder
Learning Game: Choices
Title: Choices

Questions
1. Which is included in a ideological affiliated terrorist organization?
1) religious (Correct)
2) rationalist
3) anarchist
4) political

2. Which is a political affiliated terrorist organization?
1) anarchist
2) ideological
3) right wing (Correct)
4) PETA

3. These are included in a government affiliated terrorist organization except:
1) separatist
2) ethnocentric groups
3) revolutionary
4) political (Correct)

Slide 16

Immediate Goals and Common Characteristics of Terrorist Groups
Duration: 00:00:17
Advance mode: Auto

Immediate Goals and Common Characteristics of Terrorist Groups

1-2-16

Terrorist groups, like any other organization have both immediate and long-range goals. Therefore, each act of terrorism is designed to accomplish something specific as part of an overall strategy. These immediate or short-term goals usually include one or more of the following: (NEXT SLIDE)

Slide 17

Slide 17
Duration: 00:01:52
Advance mode: Auto

Immediate Goals

- Recognition
- Eliminate western influence
- Over-reaction of government
- Harass, weaken, or embarrass government
- Destroy facilities, disrupt communications
- Discourage foreign investors
- Influence government decisions
- Free prisoners
- Satisfy vengeance

1-2-17

Obtain worldwide or local recognition for the groups cause. The publicity advertises the movement and is of utmost importance to the group. Eliminate western influence in a region. Osama bin Laden's goal is to get the United States and Israel out of the Middle East and establish a radical fundamental Islamic regime with out borders throughout the Middle East. Cause an over-reaction by the government: This is one of the basic precepts of revolutionary strategies. Over-reaction to terrorist activities may result in oppressive and restrictive population control measures, such as instituting special antiterrorist laws that allow searches warrants, detention of citizens without charges, curfews, and travel restrictions. However, people see these measures as a violation of their rights, and they also lend an element of legitimacy to grievances of the movement, creating an atmosphere more sympathetic to the terrorist cause. Harass, weaken or embarrass government security forces. Such tactics as calling in false alarms, assassinating security personnel, and conducting sophisticated raids and ambushes are used to reduce the effectiveness of security forces and erode public confidence in them Obtain money and equipment. Terrorist acts may be used to steal or extort money and equipment, especially weapons and ammunition essential to the struggle. It was paid in 1974 by the Exxon Oil Corporation for the release of Victor Samuelson, a company executive working in Argentina who had been held for 144 days by the Argentine People's Revolutionary Army. Destroy facilities and disrupt lines of communication. This tactic obviously hinders the government's ability to control the violence, both militarily and politically. It creates a chaotic atmosphere within the population in which entire Discourage foreign Investments or assistance programs. If this goal is achieved, the economy of the target country is affected, causing an increase in unemployment and a decrease in government revenues. Influence government decisions, legislation or elections. There is little

doubt the bombing of the Marine barracks in Beirut influenced our government's decision to eventually withdraw the Marines

Slide 18
Slide 18
Duration: 00:00:38
Advance mode: Auto

Characteristics

- Seek to intimidate
- Militarily weaker
- Urban based
- Highly mobile
- Well trained
- Covert

1-2-18

Characteristics of Terrorist Groups
Terrorists seek to intimidate populations by promoting and spreading fear. They are militarily weaker. This means they must resort to hit-and-run guerrilla tactics and will be reluctant to take up a static defensive posture against the stronger enemy unless they possess a "bargaining chip" such as hostages. They are usually urban based. This offers access to modern means of transportation, money-laundering mechanisms, communications systems, and international contacts. Even rural-based insurgent movements will have urban-based terrorist cells that provide special support to the movement. They are highly mobile. Being urban-based, the terrorists have access to the transportation systems and the international contacts that allow them to obtain the documents they need to travel frequently to other cities and countries for operations or in search of safe havens and support. They usually act covertly. While the clandestine nature of the terrorist groups contributes to their flexibility and effectiveness, it can also be a problem. These groups are forced to maintain and support intricate operational systems complete with personnel and assets.

Slide 19
Typical Training Programs
Duration: 00:00:37
Advance mode: Auto

Typical Training Programs

- Internal
- External

1-2-19

Typical training programs used by the terrorist groups at the organizational and individual levels
Terrorist training programs being paramilitary in nature are oriented to the mission, the physical characteristics of the area of operations, and the security environment in the operational area. Most of the training is somewhat standardized. Historically, works such as the Mini-Manual of the Urban Guerrilla by Brazilian terrorist Carlos Marighella, and the writings of revolutionary leaders Mao Tse-tung, Che Guevera, and Fidel Castro are used as instructional texts and indoctrination material. Discipline is strictly enforced, and trainees are closely monitored for signs of weakness in their ability or ideological commitment. Internal training is conducted at the cell level by members of the group within the target country, usually in a clandestine fashion.
External Training: Non-group members outside the operational area conduct external training. It

can take two different forms. First, the operatives may travel abroad, individually or as a group, to training camps or to other permanent institutions for their training.

Slide 20	Typical Training
Slide 20 **Typical Training** Duration: 00:00:21 Advance mode: Auto	**Typical Training** • Physical conditioning • Weapons and explosive training • Political indoctrination • Combat tactics and techniques • Psychological warfare • Survival skills • Communications • Specialized training 1-2-20

A typical individual terrorist training program includes most, if not all of the following:
1. Physical conditioning.
2. Weapons and explosive training, including how to purchase or manufacture explosives to construct improvised explosive devices.
3. Political indoctrination.
4. General tactics and combat techniques, including instruction on how authorities usually respond to hostage-barricade situations.5. Trade/crafts, including placing or recovering caches, opening mail covertly, surreptitious entry to homes or offices and wire-tapping.
6. Psychological warfare.
7. Survival skills, including survival in urban and foreign environments.8. Communications, including radio, telephone, "dead drops", computers and satellite. F. Since terrorist operations are paramilitary in nature, it is not surprising that there are many similarities in the training of terrorist and in the training of Special Operations Forces of the U.S. In fact, terrorists are known to have capitalized on the open nature of our society and our willingness to publish potentially damaging material such as the Anarchist's Cook Book, Poor Man's James Bond and versions of the Special Forces and Ranger operational manuals.

Slide21	
Slide21 **Choices** Interaction type: Choices Passing score: 80 Instructions: None Custom Message: None	**Learning Game Placeholder** **Learning Game: Choices** **Title: Choices**

1. Which 2 training programs are not in a typical terrorist training program?
1) Physical condition, survival skills
2) Communications, political indoctrination
3) Electronic, network warfare (Correct)
4) Weapons, explosive training

2. In accordance with the DoD the definition of external terrorist is:
Non-group members outside the operational area conduct external training. It can take two

different forms. First, the operatives may travel abroad, individually or as a group, to tr
1) True (Correct)
2) False

Slide 22 🔘 **Terrorist Operations and it's Planning Cycle** Duration: 00:00:05 Advance mode: Auto	Terrorist Operations and it's Planning Cycle 1-2-22

Will be discussed in the next few slides

Slide 23 🔘 **Slide 23** Duration: 00:00:07 Advance mode: Auto	"The main point is to select targets where success is 100% assured." *Dr. George Habash, Founder, PFLP* *(Popular Front for the Liberation of Palestine)* VII Escape and Exploitation VI Actions on the Objective V Attack Rehearsal IV Pre-attack Surveillance and Planning III Specific Target Selection II Intelligence and Surveillance I Broad Target Selection Terrorist Planning Cycle
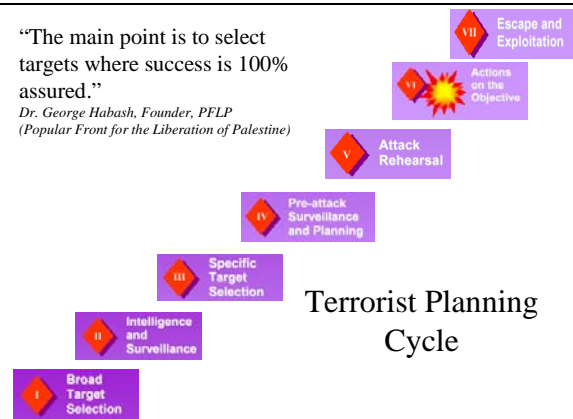
No notes for this slide

Slide 24 🔘
Slide 24
Duration: 00:00:35
Advance mode: Auto
	I Broad Target Selection
	
	• Collection of information on a large number of potential targets
	• Also includes open source and general info collection
	  - Media stories
	  - Internet
	• Potential targets may be screened based on
	  - Symbolic value
	  - Potential for high media value
	  - Objectives of group
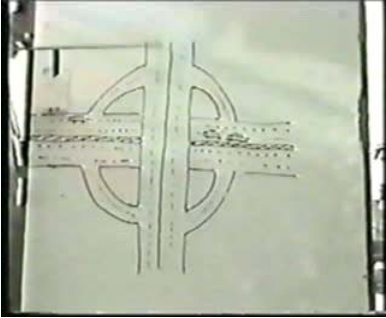	
	1-2-24

This phase is the collection of information on a large number of potential targets, some of which may never be attacked, or seriously considered for attack.
This phase also includes open source and general information collection. Some features of this type
•Stories from newspapers, other media, and journalistic sources often provide key
•Internet research provides texts, pictures, blue prints, and video information.
•Potential targets are screened based on symbolic value and their potential to generate high

profile media attention.

Slide 25 📎
Slide 25
Duration: 00:00:30
Advance mode: Auto
	Intelligence and Surveillance
	
	• Targets showing potential receive a higher priority
	  - Determine if target is beyond group's capability.
	  - Will it meet intended objectives?
	• Information gathered include
	  - Practices/Procedures/Routines
	  - Residence & Workplace
	  - Transportation/Routes of Travel
	  - Security Measures
	
	1-2-25

Targets showing potential vulnerabilities are given a higher priority of effort.
This priority establishes the requirement to gather additional information on the targets' patterns over time.

Slide 26 📎
Slide 26
Duration: 00:00:37
Advance mode: Auto
	Specific Target Selection
	
	• Selection of a target for actual operational planning considers some of the following factors:
	  - Does success affect a larger audience than the immediate victim(s)?
	  - Will the target attract high profile media attention?
	  - Does success make the desired statement to the correct target audience(s)?
	  - Is the effect consistent with objectives of the group?
	  - Does the target provide an advantage to the group by demonstrating its capabilities?
	  - What are the costs versus benefits of conducting the operation?
	
	1-2-26

No notes for this slide

Slide 27 📎
Slide 27
Duration: 00:00:30
Advance mode: Auto
	Pre-attack Surveillance and Planning
	
	• Detailed and often long term surveillance is conducted
	  - Conduct security studies.
	  - Conduct detailed preparatory operations.
	  - Recruit specialized operatives (if needed).
	  - Procure a base of operations in the target area (safe houses, caches, etc.).
	  - Design and test escape routes.
	  - Decide on type of weapon or attack.
	
	1-2-27

No notes for this slide

Slide 28	

Slide 28
Duration: 00:00:14
Advance mode: Auto
	Attack Rehearsal
	
	• Attack plan is developed
	  - Improve the odds of success
	  - Confirm planning assumptions
	  - Develop contingencies.
	
	1-2-28

No notes for this slide	

Slide 29
 	
Slide 29
Duration: 00:00:34
Advance mode: Auto
	Actions on the Objective
	
	• Terrorists conducting planned operations possess important tactical advantages.
	  - Surprise
	  - Choice of time, place, and conditions of attack.
	  - Employment of diversions and secondary or follow-up attacks.
	  - Employment of security and support positions to neutralize target reaction forces and security measures.
	  - It may be months before planned-for circumstances occur and the attack takes place
	
	1-2-29

No notes for this slide	

Slide 30
 	
Slide 30
Duration: 00:00:33
Advance mode: Auto
	Escape and Exploitation
	
	• Escape plans are usually well rehearsed and executed.
	  - Many terrorists want to survive the operation and escape.
	  - Exception is suicide operation but support personnel may need to get-away
	• Exploitation is the primary objective of the operation.
	
	1-2-30

Media control measures, prepared statements, and a host of other preparations are made to effectively exploit a successful operation. These will be timed to take advantage of media cycles for the selected target audiences.	

Slide 31 🏅
Most Common Terrorist Threats
Duration: 00:00:32
Advance mode: Auto

Most Common Terrorist Threats

- Bombings (Suicide)
- Arson
- Kidnapping/Extortion
- Hijacking
- Skyjacking (Suicide)
- Assassination
- Maritime operations
- Standoff attacks

- Ambushes
- Armed Raid
- Hostage Taking/ Barricade Situation
- Maimings

1-2-31

1. First teaching point. Bombings are without a doubt the most prevalent way to accomplish a terrorist act and will remain so for the foreseeable future.
2. Hostage taking incidents demand a higher degree of expertise and planning and are usually done only by groups that have evolved to a high degree of proficiency in other less sophisticated terrorist acts. We will discuss all these common terrorist acts in greater detail shortly.
3. IED

Slide32
Choices
Interaction type: Choices
Passing score: 60
Instructions: None
Custom Message: None

Learning Game Placeholder
Learning Game: Choices
Title: Choices

1. In this phase, the collection of information on a large number of potential targets, some of which may never be attacked, or seriously considered for attack.
1) Intelligence and surveillance
2) Target selection (Correct)
3) Pre-attack
4) Attack rehearsal

2. During this phase security studies and design escape routes are conducted.

1) Attack phase
2) Pre-attack surveillance and planning (Correct)
3) Target selection
4) Delivery

3. Most prevalent way to accomplish a terrorist act is:
1) IED bomb (Correct)
2) shoe bomb
3) plane bomb
4) kidnapping

Slide 33	***Future Trends***
Slide 33 Duration: 00:00:34 Advance mode: Auto	"Between now and 2015 terrorist tactics will become increasingly sophisticated and designed to achieve mass casualties." *National Intelligence Council* *"Global Trends 2015: A Dialogue About the Future With Nongovernmental Experts" Report (Dec 2000).* 1-2-33

Terrorism as a conflict method that has survived and evolved through several millennia to flourish in the modern information age, terrorism continues to adapt to meet the challenges of emerging forms of conflict, and exploit developments in technology and society. Terrorism has demonstrated increasing abilities to adapt to counter-terrorism measures and political failure. Terrorist are developing new capabilities of attack and improving the efficiency of existing methods. Additionally, terrorist groups have shown significant progress in escaping from a subordinate role in nation-state conflicts, and becoming prominent as international influences in their own right. They are becoming more integrated with other sub-state entities, such as criminal organizations and legitimately chartered corporations, and are gradually assuming a measure of control and identity with national governments.

Slide 34	CBRNE THE NEW TERRORISM Nuclear MUSTARD GAS Chemical High Yield Explosive Radiological the ANTHRAX threat Biological
Slide 34 Duration: 00:00:10 Advance mode: Auto	

No notes for this slide:

Slide 35	**END**
Slide 35 Duration: 00:00:05 Advance mode: Auto	

APPENDIX E.   STORYBOARD FOR LESSON TWO. INSTRUCTIONAL MATERIALS

MOVES INSTITUTE

Defense in Depth / Preplanned Responses

Lesson Topic
2.1

Presentation Details:
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
Presenter Details:
Name: Wilfredo Cruzbaez
Title: LT, USN

Slide 1 🔊	
Slide 1 Duration: 00:00:06 Advance mode: Auto	 *Defense in Depth / Preplanned Responses* Lesson Topic 2.1

No notes for this slide

Slide 2 🔊	
Enabling Objectives Duration: 00:00:30 Advance mode: Auto	**Enabling Objectives** • STATE the purpose of Defense in Depth • DESCRIBE the principles of Defense in Depth • DESCRIBE the Assess, Warning and Threat Zones as used in the antiterrorism program concept of Defense in Depth • DESCRIBE a Naval Vessel Protection Zone (NVPZ)

No notes for this slide

Slide 3 🔊	
Enabling Objectives Duration: 00:00:13 Advance mode: Auto	**Enabling Objectives** • DESCRIBE the purpose of pre-planned responses. • DESCRIBE the likely terrorist threats for developing pre-planned responses.

No notes for this slide

Slide 4 🔊	Introduction
Introduction Duration: 00:00:22 Advance mode: Auto	**"AT/FP training must be elevated to the same priority as primary mission training."** **"OPERATIONALIZE AT/FP!!!!!!"**

As a result of the commission on the investigation of the USS Cole attack it was recommended that "AT/FP training must be elevated to the same priority as primary mission training."
" We need to make AT/FP as important as damage control, Anti-Air warfare and other Navy primary missions.

Slide 5 🔊	Defense in Depth
Defense in Depth Duration: 00:00:16 Advance mode: Auto	<u>Purpose</u>: To provide principles of Defense in Depth and associated concepts of the Navy Antiterrorism Program in order to link antiterrorism countermeasures with specified tasks.

Defense in Depth
  a. Purpose
   (1) To provide principles of Defense in Depth and associated concepts of the Navy Anti-terrorism Program in order to link anti-terrorism countermeasures with specified tasks.

Slide 6 🔊	Defense in Depth
Defense in Depth Duration: 00:00:24 Advance mode: Auto	• Engaging the enemy at the earliest opportunity with security forces. • Employing weapons at maximum effective range. • Using blocking positions, obstacles, and supplementary positions throughout the area. • Positioning and moving reserves and fire support units (Reaction Force).

Conventional operations Defense in Depth is achieved by:
(1) Engaging the enemy at the earliest opportunity with security forces.
(2) Employing weapons at maximum effective range
(3) Using blocking positions, obstacles, and supplementary positions throughout the area.

(4) Positioning and moving reserves and fire support units (Reaction Force).	

Slide 7
 Principles – Layered Defense
 Duration: 00:00:08
 Advance mode: Auto
	Principles – Layered Defense
	
	 Three Zones:
	
	     - Assessment (Detect)
	
	     - Warning (Deter)
	
	     - Threat (Defend/Mitigate)

The three principles of Layered defense
(1) Assessment
(2) Warning
(3) Threat

Slide 8 **Defense in Depth** Duration: 00:00:28 Advance mode: Auto	**Defense in Depth** • <u>Assessment Zone</u> - allows for initial ID of potential threat. *"We must separate the terrorists from the background noise." ADM Gehman* • <u>Warning Zone</u> - provides the area where the security force may respond with initial and escalating measures including warnings, challenges, use of non-lethal weapons if appropriate, and if time permits shouldering the threat. • <u>Threat Zone</u> - engagement and destruction of the threat

Assessment Zone
(a) Allows for initial ID of potential threat.
Warning Zone
(a) Provides the area where the security force may respond with initial and escalating measures including warnings, challenges, use of non-lethal weapons if appropriate, and if time permits shouldering the threat.
Threat Zone
(a) Engagement and destruction of the threat

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Slide 9
Three Zones
Duration: 00:00:12
Advance mode: Auto

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Three Zones

ID, Track, Assess, and Neutralize

"Set Conditions for the Use Of Force"

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The purposes of the three zones are to:
"ID, Track, Assess, Neutralize"
"Set Conditions for Use of Force"

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Slide 10
NVPZ
Duration: 00:01:16
Advance mode: Auto

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FOR OFFICIAL USE ONLY

NVPZ

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The Naval Vessel Protection Zone uses the same principles of layered defense.
The assessment zone, in the assessment zone contacts are identified by means of radar, radio communications or visual.
The warning zone, in the warning zone contacts are given warnings and challenges.
  (a) Warnings are conducted in English and in the local language if in a foreign country.
  (b) Challenges are conducted in English and in the local language if in a foreign country.
  (c) Ensure that the vessel being challenge is aware that he is being challenged by Non-Lethal means.
The threat zone, if the contact does not display compliance with the previous warnings the watch stander has to determine the threat of the contact.
Determining the threat is done by determining the contacts capability, opportunity and intent.
Capability refers to: Does the contact posses the capability to harm our forces?
Opportunity refers to: Is there an opportunity for the contact to harm our forces?
Intent refers to: Is the intent of the contact to harm our forces?

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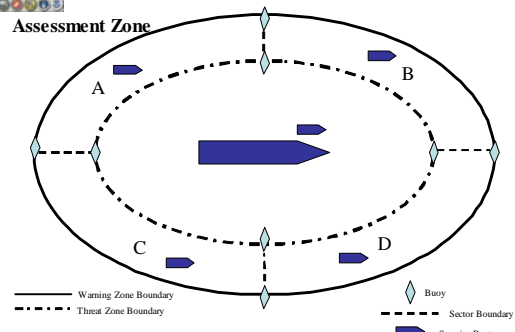
Slide 11
Inport Security
Duration: 00:01:12
Advance mode: Auto

Inport Security

Extended Security Zone
- Random Patrols
- Personal Arms
- Communications
- Small Boats
- Patrol cars
- Radars

Observation Post
- Personal Arms
- Communications
- Mobile
- Night Vision

Perimeter Security Zone
- Day / Night Observation
- Small Boats
- Sea Barriers
- Personal Arms

Aflo at AAW A/SW Screen

External Security Zone
- Armed Sentries
- SMGs
- Riot Control Agents
- Hardened Barricades
- 100% Illumination
- Armed Sentries

The Naval Vessel Protection Zone and the Defense in depth concept also applies to ships in-port
The Extended security zone – delineated by the Dashed Blue line corresponds to the assessment zone.
Assets used in this area are:
    (a) Shore side:
  HMMVs or patrol cars
  Armed Personnel with Id checks at the gates.
    (b) Sea side
  Communications
  Radar equipment
  Small Boats
The Perimeter security zone – delineated by the Solid green corresponds to the warning zone.
Assets used in this area are:
    (a) Shore side
  Armed Pier sentries at the ECPs
    (b) Sea side
  Small Boats
  Sea Barriers
The External security zone – delineated by the solid yellow line corresponds to the threat zone.
Assets used in this area are:
    (a) Shore side
  Armed Pier rovers
  Armed Topside rovers
  100% illumination of pier areas
    (b) Sea side
  Small Boats
  Sea Barriers
  Armed Topside rovers
  100% illumination of ship boundaries with the water

Slide 12 🔊
Slide 12
Duration: 00:00:29
Advance mode: Auto
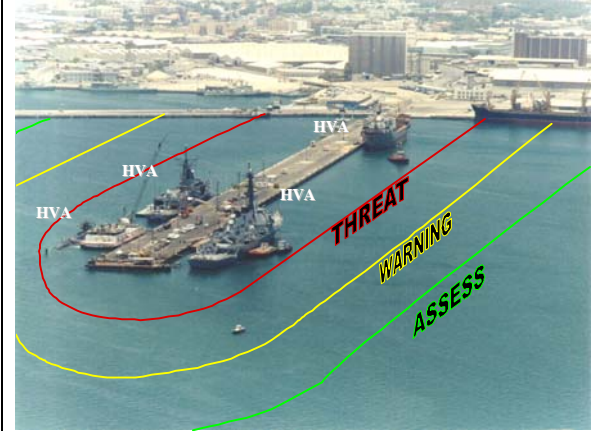
High Value Assets
High value assets are those assets that the enemy wants to target because:
The target's symbolic value
The target's potential to generate high profile media attention
The target is the objective of the terrorist group
This picture was taken prior to the USS Cole attack, security was not our number one priority.

Slide 13 🔊
Slide 13
Duration: 00:00:10
Advance mode: Auto
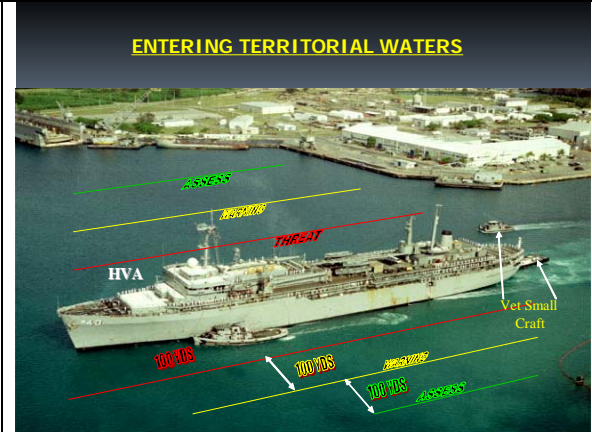
The Naval Vessel Protection Zone and the Defense in depth concept also applies to ships transiting in or out of port and in narrow channels.

Slide 14 🔊
Pre-Planned Reponses (PPR)
Duration: 00:00:24
Advance mode: Auto

Pre-Planned Reponses (PPR)

- PPRs are developed, exercised actions and measures that are implemented to:
  - Track
  - Assess
  - Neutralize terrorist threats
- PPRs are the tactics, techniques used to carry out the AT program concept of:
  - Detect
  - Deter
  - Defend
  - Mitigate

Pre-Planned Reponses (PPR's) are developed, exercised actions and measures that are implemented to:
  a. Track
  b. Assess

c. Neutralize terrorist threats

PPR's are the tactics, techniques used to carry out the AT program concept of:
(1) Detect
(2) Deter
(3) Defend
(4) Mitigate

Slide 15 🐭 **Pre-Planned Reponses (PPR)**
Duration: 00:00:31
Advance mode: Auto
	Pre-Planned Reponses (PPR)
	
	• Likely threats:
	  - Small boats/Deep draft vessels
	  - Swimmers/Mines
	  - Personnel-borne IEDs
	  - Vehicle-born IEDs
	  - Rail-born IEDs
	  - Aircraft
	  - Standoff attacks
	  - Man-portable defense systems (MANPADS)
	  - CBNE attacks (covert-overt)

Likely threats to U.S. Assets
(1) Small boats/Deep draft vessels
(2) Swimmers/Mines
(3) Personnel borne IEDs
(4) Vehicle-born IEDs
(5) Rail-born IEDs
(6) Aircraft
(7) Standoff attacks
(8) Man-portable defense systems (MANPADS)
(9) CBRNE attacks (covert-overt)

Slide 16 🐭 **Pre-Planned Reponses (PPR)**
Duration: 00:00:23
Advance mode: Auto
	Pre-Planned Reponses (PPR)
	
	• PPRs are inherent in your COA development
	  - During war gaming each friendly COA is examined against selected threat COAs
	  - If a certain threat attacks or endangers the command, it is essential to know how the command will react with PPRs.
	    • Sufficient
	    • Timely

PPR's are inherent in your course of action (COA) Development
(1) During war gaming each friendly COA is examined against selected threat COAs
(2) If a certain threat attacks or endangers the command, it is essential to know how the command will react with PPR's
(a) Sufficient
(b) Timely

Slide 17 🔘	**Pre-Planned Reponses (PPR)**

Pre-Planned Reponses (PPR)
Duration: 00:00:26
Advance mode: Auto
	• Pre-Planned Responses
	  - NTTP 3-07.2.1, Chapter 6
	  - Good check list of PPRs
	  - Must look beyond check lists
	• Must think critically and dynamically about potential threats for each mission and for each vulnerability.

Pre-Planned Responses
(1) NTTP 3-07.2.1, Rev A, Chapter 6
(2) Good check list of PPR's
(3) Must look beyond check lists
(4) Must think critically and dynamically about potential threats for each mission and for each vulnerability

Slide 18 🔘	
Set up defense in depth for the NAVSTA scenario and list and observe the pre-planned responses for boat-born IED. Duration: 00:00:13 Advance mode: Auto	**Set up defense in depth for the NAVSTA scenario and list and observe the pre-planned responses for boat-born IED.**

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APPENDIX F.   STUDY I PRE-TEST WITH ANSWERS

NAME_____   Pre-Test:

True/False, 5 points, 1 attempt(s) permitted.
1. In accordance to the Department of Defense terrorism is defined as:
The calculated use of violence or threat of violence to inculcate fear; intended to coerce or to intimidate governments or societies in the pursuit of goals that are generally political, religious or ideological".
(In accordance to the Department of Defense terrorism is defined as: The calculated use of violence or threat of violence to inculcate fear; intended to coerce or to intimidate governments or societies in the pursuit of goals that are generally political, religious or ideological".)

Correct	Choice
X	True
	False

True/False, 5 points, 1 attempt(s) permitted.
2. The categories of terrorist organizations are:
government affiliated, motivation, ideological (The categories of terrorist organizations are: government affiliated, motivation, ideological)

Correct	Choice
X	True
	False

Multiple Response, 5 points, 1 attempt(s) permitted.
3. Multiple response question:
Government affiliated terrorist organization are comprised of the following:
(Multiple response question: Government affiliated terrorist organization are comprised of the following:)

Correct	Choice
X	non-state supported
	Religious
X	state-supported
	Government
X	state-directed

Multiple Choice, 5 points, 1 attempt(s) permitted.

4. Motivation affiliated terrorist organization are comprised of the following except:

Correct	Choice
	Separatist
	ethnocentric groups
X	Ideological
	Nationalistic
	Revolutionary

Multiple Response, 5 points, 1 attempt(s) permitted.
5. Multiple response question:
Ideological affiliated terrorist organization are comprised of the following except:
(Multiple response question: Ideological affiliated terrorist organization are comprised of the following except:)

Correct	Choice
	Political
X	Nationalist
	Religious
	social orientation
X	Terrorism

Multiple Choice, 5 points, 1 attempt(s) permitted.
6. Political affiliated terrorist organization are comprised of the following:

Correct	Choice
X	Right wing, Left wing, Anarchist
	Right wing, Left wing, Center
	Center, Left wing, Anarchist
	Left wing, Anarchist, Center
	Right wing, Center, Anarchist

Multiple Choice, 5 points, 1 attempt(s) permitted.
7. Terrorist hope to accomplish the following goals except:

Correct	Choice
	Recognition
	Vengeance
	Weaken government
X	create their own government
	discourage foreign investment

True/False, 5 points, 1 attempt(s) permitted.
8. The definition of internal terrorist training is: conducted at the cell level by members of the group within the target country, usually in a clandestine fashion. (The definition of internal terrorist training is: conducted at the cell level by members of the group within the target country, usually in a clandestine fashion.)

Correct	Choice
X	True
	False

Multiple Choice, 5 points, 1 attempt(s) permitted.
9. These training programs are included in a typical terrorist training program except:
(These training programs are included in a typical terrorist training program except:)

Correct	Choice
	Physical condition
	Weapons training
	Political indoctrination
	Combat tactics
X	Capital investment

Multiple Choice, 5 points, 1 attempt(s) permitted.
10. Which one of these is a characteristic of a terrorist group:

Correct	Choice
	Overt
	Military strong
	Based outside urban areas
	Poor training
X	Highly mobile

Multiple Choice, 5 points, 1 attempt(s) permitted.
11. The first stage of a terrorist attack is:

Correct	Choice
X	Target selection
	Intelligence and surveillance
	Pre-attack
	Specific target selection
	Attack rehearsal

Multiple Choice, 5 points, 1 attempt(s) permitted.

12. In this phase, Targets showing potential vulnerabilities are given a higher priority of effort. This priority establishes the requirement to gather additional information on the targets' patterns over time.

Correct	Choice
	Target selection
X	Intelligence and surveillance
	Pre-attack
	Specific target selection
	Attack rehearsal

Multiple Choice, 5 points, 1 attempt(s) permitted.

13. Once a target is selected the following surveillance is conducted except:

Correct	Choice
	Conduct security studies
	Recruit specialized operatives
	Design and test escape routes
	Decide on attack weapon
X	Determine the objective of the group

Multiple Choice, 5 points, 1 attempt(s) permitted.

14. The last step of a terrorist attack is:

Correct	Choice
X	Escape and exploitation
	Attack
	Actions on the objective
	Attack rehearsal

Multiple Choice, 5 points, 1 attempt(s) permitted.

15. All of these are common terrorist threats except:

Correct	Choice
	Bombing
	Arson
	Ambushes
	Maiming
X	War

16. Based on what we learned on this course a future terrorist tactic may include:

Correct	Choice
	Computer attack
	Bombs delivered by animals
	Shoe bombs
X	CBRNE
	Liquid bombs on airplanes

17. Terrorist will be looking to achieve this type of casualty by the year 2015:

Correct	Choice
	Network casualties
	Economy casualties
X	Mass casualties
	Political casualties

18. These are tactical advantages of a terrorist conducting an attack except:

Correct	Choice
	Choice of time
	Choice of place
X	Numbers of security forces
	Surprise
	Diversions for follow up attacks

19. These type of groups are dedicated to the overthrow of an established order and replacing it with a new political or social structure. (These type of groups are dedicated to the overthrow of an established order and replacing it with a new political or social structure.)

Correct	Choice
	Separatist group
	Ethnocentric group
X	Revolutionary group
	Political group

Multiple Choice, 5 points, 1 attempt(s) permitted.

20. These type of groups operate as an agent of a government and receive substantial

intelligence, logistic, and operational support from the sponsoring government.
(These type of groups operate as an agent of a government and receive substantial
intelligence, logistic, and operational support from the sponsoring government.)

Correct	Choice
	State supported
	Non-state supported
X	State directed
	Proxy army

APPENDIX G.   STUDY I POST-TEST WITH ANSWERS

NAME_____   Pre-Test:

True/False, 5 points, 1 attempt(s) permitted.

1. The following elements are essential in the definition of terrorism in accordance to the Department of Defense:
violence or threat of violence, fear, coercion, pursuit of goals (The following elements are essential in the definition of terrorism in accordance to the Department of Defense: violence or threat of violence, fear, coercion, pursuit of goals)

Correct	Choice
X	True
	False

Multiple Response, 5 points, 1 attempt(s) permitted.

2. Multiple response question:
Which is/are categories of terrorist organization? (Multiple response question: Which is/are categories of terrorist organization?)

Correct	Choice
X	government affiliated
	state governed
X	Motivation
	Separatist
X	Ideological

Multiple Response, 5 points, 1 attempt(s) permitted.

3. Which is an indication of a government affiliated terrorist organization?

Correct	Choice
X	state support
	Violence
	Threat
	Fear
	Coercion

Multiple Choice, 5 points, 1 attempt(s) permitted.

4. These are included in a government affiliated terrorist organization except:

Correct	Choice
	Separatist
	ethnocentric groups
	Nationalistic
	Revolutionary
X	Political

Multiple Choice, 5 points, 1 attempt(s) permitted.

5. Which is included in a ideological affiliated terrorist organization?

Correct	Choice
X	Religious
	Rationalist
	Nationalist
	Anarchist

Multiple Response, 5 points, 1 attempt(s) permitted.

6. Multiple response question:
Which is/are included in a political affiliated terrorist organization? (Multiple response question: Which is/are included in a political affiliated terrorist organization?)

Correct	Choice
X	right wing
X	left wing
X	Anarchist
	Religious
	Radicalism

Multiple Choice, 5 points, 1 attempt(s) permitted.

7. Which one of these is a goal terrorists do not want to achieve?

Correct	Choice
	Eliminate western influence, recognition
	Free prisoner, satisfy vengeance
	Influence government decisions, disrupt government
X	Generate money, create their own government

Multiple Choice, 5 points, 1 attempt(s) permitted.

8. Which 2 training programs are not in a typical terrorist training program.
(Which 2 training programs are not in a typical terrorist training program.)

Correct	Choice
	Physical condition, survival skills
	Communications, political indoctrination
	Weapons, explosive training
X	Electronic, network warfare

True/False, 5 points, 1 attempt(s) permitted.

9. In accordance with the DoD the definition of external terrorist is:
Non-group members outside the operational area conduct external training. It can take two different forms. First, the operatives may travel abroad, individually or as a group, to training camps or to other permanent institutions for their training.
(In accordance with the DoD the definition of external terrorist is: Non-group members outside the operational area conduct external training. It can take two different forms. First, the operatives may travel abroad, individually or as a group, to training camps or to other permanent institutions for their training.)

Correct	Choice
X	True
	False

Multiple Choice, 5 points, 1 attempt(s) permitted.

10. Which one of these is a characteristic of a terrorist group:

Correct	Choice
X	Covert
	Urban based
	Well trained
	Overt
	Military weaker

Multiple Choice, 5 points, 1 attempt(s) permitted.

11. In this phase, the collection of information on a large number of potential targets, some of which may never be attacked, or seriously considered for attack.

Correct	Choice
X	Target selection
	Intelligence and surveillance
	Pre-attack
	Specific target selection
	Attack rehearsal

12. Selection of a target in the target selection stage, for actual operational planning considers some of the following factors except:

Correct	Choice
	Will the target attract high profile media attention?
	Does success make the desired statement to the correct target audience(s)?
	Is the effect consistent with objectives of the group?
	the target provide an advantage to the group by demonstrating its capabilities?
X	Are escape routes available?

13. During this phase security studies and design escape routes are conducted.

Correct	Choice
	Attack phase
X	Pre-attack surveillance and planning
	Target selection
	Attack
	Attack rehearsal

14. Which one of these is not a stage of the terrorist planning cycle.

Correct	Choice
	Target selection
	Intelligence and surveillance
	Attack
	Actions on the objective
X	Communication with media

15. Most prevalent way to accomplish a terrorist act is:

Correct	Choice
	Kidnapping
X	IED bombings
	Car jacking
	Plane hijacking
	Arson

16. The following are future trends of terrorist tactics except:

Correct	Choice
	CBRNE
	IED bombs
X	UAV delivered bombs
	High yield explosives
	Nuclear dirty bomb

17. The primary objective of a terrorist plan is:

Correct	Choice
X	Exploitation
	Economic success
	People anger
	Suicide for afterlife rewards

18. These group objective is the separation from existing entities through independence, political autonomy, or religious freedom or domination. Their ideologies subscribe to include social justice or equity, anti-imperialism, as well as the resistance to conquest or occupation by a foreign power.
(These group objective is the separation from existing entities through independence, political autonomy, or religious freedom or domination. Their ideologies subscribe to include social justice or equity, anti-imperialism, as well as the resistance to conquest or occupation by a foreign power.)

Correct	Choice
X	Separatist group
	Ethnocentric group
	Revolutionary group
	Political group

Multiple Choice, 5 points, 1 attempt(s) permitted.

19. These are terrorist groups that operate autonomously, receiving no significant support from any government.
(These are terrorist groups that operate autonomously, receiving no significant support from any government.)

Correct	Choice
	State supported
X	Non-state supported
	State directed
	Proxy army

Multiple Choice, 5 points, 1 attempt(s) permitted.

20. This is the definition of a deliberate terrorist element.

Correct	Choice
X	Terrorism is an activity planned and intended to achieve particular goals.
	Terrorist groups demand change, revolution or political movement.
	The intended result is to create a psychological terror
	Violence, coercion, and destruction are used in the commission of the act. Violence, coercion, and destruction are used in the commission of the act.

APPENDIX H.   STUDY II PRE-TEST WITH ANSWERS

NAME_____   Pre-Test:

Pre-Test objectives:
1. Measure the student's knowledge about the following subjects:
- Defense in Depth
- Assessment, Warning and Threat Zones as used in the anti-terrorism program
- Naval Vessel Protection Zone (NVPZ)
- Pre-planned responses.

1. **What is the purpose of defense in depth?**

	a. To provide the ATO with pre-planned responses in case of terrorist attacks.
X	b. To provide principles of Defense in Depth and associated concepts of the Navy Anti-terrorism Program in order to link anti-terrorism countermeasures with specified tasks.
	c. To engage the enemy at the earliest opportunity.
	d. Employ weapons at the maximum effective range.

2. **Which answer contains 2 principles of defense in depth?**

	a. The use of small boats and shipboard security forces.
	b. Engage enemy forces at the earliest opportunity to prevent further damage.
X	c. Engaging the enemy at the earliest opportunity, employ weapons at maximum effective range.
	d. using obstacles throughout the area and small boats.

3. **What are the principles of layered defense as used in
Anti Terrorism Force Protection (AT/FP)?**

X	a. Assessment, warning and threat.
	b. Assessment, warning and capability opportunity intent (COI).
	c. Assessment, threat and COI.
	d. none of the above.

4. **What is the proper definition for assessment zone:**

X	a. Allows for initial ID of potential threat.
	b. Provides the area where the security force may respond with initial and escalating measures including warnings, challenges, use of non-lethal weapons if appropriate, and if time permits shouldering the threat.

	c. Engagement and destruction of the threat.
	d. Area where capability, opportunity and intent are determined.

5. What is the proper definition for warning zone:

	a. Allows for initial ID of potential threat.
X	b. Provides the area where the security force may respond with initial and escalating measures including warnings, challenges, use of non-lethal weapons if appropriate, and if time permits shouldering the threat.
	c. Engagement and destruction of the threat.
	d. Area where capability, opportunity and intent are determined.

6. What is the proper definition for threat zone:

	a. Allows for initial ID of potential threat.
	b. Provides the area where the security force may respond with initial and escalating measures including warnings, challenges, use of non-lethal weapons if appropriate, and if time permits shouldering the threat.
X	c. Engagement and destruction of the threat.
	d. Area where capability, opportunity and intent are determined.

7. What is the purpose of the Assessment, warning and threat zones?

	a. Neutralize terrorist contacts.
	b. Warn unidentified vessels of the Naval Vessel Protection Zone.
X	c. ID, Track, Assess, Neutralize and Set Conditions for Use of Force.
	d. Allows for initial ID of potential threat.

8. How is the Naval Vessel Protection Zone organized?

	a. ID
	b. Warn
	c. Assessment
X	d. threat

9. What asset is used in the Assessment zone?

X	a. Patrol craft.
	b. Air search radars.
	c. Intelligence briefs.
	d. NCIS

10. **Which actions the watch-stander must take when an unidentified vessel enters the warning zone?**

	a. Ensure that the vessel being challenge is aware that he is being challenged
	b. Small arm fire across their bow.
	c. Use the patrol boat to shoulder the contact.
X	d. Verbal Warnings in English and in the local language if in a foreign country.

11. **Which criteria the watch stander uses to determine threat?**

	a. Opportunity
	b. Capability
	c. Intent
X	d. threat

12. **What is the purpose of Pre-planned responses?**

	a. Rehearse terrorist attacks.
X	b. Track, assess and neutralize terrorist threats.
	c. Plan for terrorist possible actions.
	d. Neutralize terrorist threats.

13. **Can Pre-Planned Responses be modified to tailor specific situations?**

X	a. True
	b. False

14. **Multiple answer question**
Select (3) likely threats that any command has to be prepared for?

X	a. Small boats/Deep draft vessels
X	b. Swimmers/Mines
	c. submarine attacks.
	d. WMD.
X	e. CBRNE attacks (covert-overt)

15. **How are Pre-Planned Responses used in AT/FP program?**

	a. Used to prevent terrorist attacks.
	b. Used in after action reports to evaluate incidents.
X	c. During war gaming each friendly COA is examined against selected threat COAs.
	d. check list.

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APPENDIX I.   STUDY II POST-TEST WITH ANSWERS

NAME_____   Post-Test:

Post-Test objectives:
1. Measure the student's knowledge about the following subjects:
- Defense in Depth
- Assessment, Warning and Threat Zones as used in the anti-terrorism program
- Naval Vessel Protection Zone (NVPZ)
- Pre-planned responses.

1. **What is the purpose of defense in depth?**

	a. To provide the ATO with pre-planned responses in case of terrorist attacks.
X	b. To provide principles of Defense in Depth and associated concepts of the Navy Anti-terrorism Program in order to link anti-terrorism countermeasures with specified tasks.
	c. To engage the enemy at the earliest opportunity.
	d. Employ weapons at the maximum effective range.

2. **Are Pre-Planned Responses used in Course of Action development?**

X	a. True
	b. False

3. **What does a good AT/FP Officer must do to ensure that he assesses all the possible terrorist threats?**

	a. Ask a lot of questions.
	b. Use check lists only.
X	c. Must think critically and dynamically about potential threats for each mission and for each vulnerability.
	d. Practice, practice, practice.

4. **Which are the 3 principles of layered defense as used in Anti Terrorism Force Protection (AT/FP)?**

X	a. Assessment, warning and threat.
	b. Assessment, warning and capability opportunity intent (COI).
	c. Assessment, threat and COI.
	d. none of the above.

5. **What is the proper definition for assessment zone:**

X	a. Allows for initial ID of potential threat.
	b. Provides the area where the security force may respond with initial and escalating measures including warnings, challenges, use of non-lethal weapons if appropriate, and if time permits shouldering the threat.
	c. Engagement and destruction of the threat.
	d. Area where capability, opportunity and intent are determined.

6. **What is the proper definition for warning zone:**

	a. Allows for initial ID of potential threat.
X	b. Provides the area where the security force may respond with initial and escalating measures including warnings, challenges, use of non-lethal weapons if appropriate, and if time permits shouldering the threat.
	c. Engagement and destruction of the threat.
	d. Area where capability, opportunity and intent are determined.

7. **What is the proper definition for threat zone:**

	a. Allows for initial ID of potential threat.
	b. Provides the area where the security force may respond with initial and escalating measures including warnings, challenges, use of non-lethal weapons if appropriate, and if time permits shouldering the threat.
X	c. Engagement and destruction of the threat.
	d. Area where capability, opportunity and intent are determined.

8. **What is the purpose of the assessment, warning and threat zones?**

	a. Neutralize terrorist contacts.
	b. Warn unidentified vessels of the Naval Vessel Protection Zone.
X	c. ID, Track, Assess, Neutralize and Set Conditions for Use of Force.
	d. Allows for initial ID of potential threat.

9. **How is the Naval Vessel Protection Zone organized?**

	a. ID
	b. Warn
	c. Assessment
X	d. Assessment

10. **What asset is used in the Assessment zone?**

X	a. Patrol craft.
	b. Air search radars.
	c. Intelligence briefs.
	d. NCIS

11. **Which criteria does the watch-stander uses to determine threat?**

	a. Opportunity
	b. Capability
	c. Intent
X	d. HVU

12. **What is the purpose of Pre-planned responses?**

	a. Rehearse terrorist attacks.
X	b. Track, assess and neutralize terrorist threats.
	c. Plan for terrorist possible actions.
	d. Neutralize terrorist threats.

13. **Can Pre-Planned Responses be modified to tailor specific situations?**

X	a. True
	b. False

14. **Multiple answer question**
   Select (3) likely threats that any command has to be prepared for?

X	a. Small boats/Deep draft vessels
X	b. Swimmers/Mines
	c. submarine attacks.
	d. WMD.
X	e. CBRNE attacks (covert-overt)

15. **How are Pre-Planned Responses used in AT/FP program?**

	a. Used to prevent terrorist attacks.
	b. Used in after action reports to evaluate incidents.
X	c. During war gaming each friendly COA is examined against selected threat COAs.
	d. check list.

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APPENDIX J.   SAMPLE PORT BRIEFING INFORMATION SHEET

INFORMATION SHEET 1
TASK 3

10 May 2007.

From: Commanding Officer

To: Designated Anti-terrorism Officer

Subj: IN PORT SECURITY PLAN ICO ANY PORT FOR A PORT VISIT

1.   Two days from now, at approximately 2000 Local, we will be arriving in any port for a (4) day port visit. We will depart at 0600 Local on the fourth day.

2. The Freedom Fighters United (FFU) is an Islamic fundamentalist based group consisting of approximately 10 members with ties to Hizballah and HAMAS terrorist organizations operating in the Middle East. FFU conducts their operations covertly primarily in and around the city of nay city, any state. Operatives have been observed in the past around the area of NAVSTA nay NAVSTA to what appears conducting surveillance. With the exception of protests at the base gates in April 2007 by members of the FFU, there are no indications of preparations for an attack by any organization to military assets on the base. FBI reports that the FFU have recently purchased 2 small boats. Last week an Army explosives DEPOT was broken into and large quantities of explosives were stolen. FBI is investigating but preliminary reports point to the FFU.

3.   Any NAVSTA is currently in FPCON Bravo.

4. TASKING:

a.   You area directed to review directives and instructions regarding AT/FP planning and In Port Security Plans (ISP).

b.   Given 2 RHIBS, pier radar and barriers use the AFTP SavageStudio to develop an asset deployment and use given pre planned responses against explosive laden vessels.

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APPENDIX K.   INSTITUIONAL REVIEW BOARD (IRB) FORMS

Naval Postgraduate School
Informed Consent Form

Introduction. You are invited to participate in a study entitled Training effectiveness of Force Protection Training using Computer-based Instruction with embedded Simulation being conducted by the Naval Postgraduate School MOVES Institute.

Procedures. You will be asked to complete a questionnaire with questions about your rank, rate and assignments previous and current. You will conduct a pre-test about Force protection knowledge, that way we can measure your base knowledge. Second you will complete a CBT lesson on Force Protection, and then you will complete a Force Protection scenario. The conclusion of the research will be after completion of the post-test, to measure if any knowledge has been acquired. Total time required 45 minutes.

Risks and Benefits. I understand that this project does not involve greater than minimal risk and involves no known reasonably foreseeable risks or hazards greater than those encountered in everyday life.   I have also been informed of any benefits to myself or to others that may reasonably be expected as a result of this research.

Compensation. I understand that no tangible compensation will be given. I understand that a copy of the research results will be available at the conclusion of the experiment via e-mail and thesis results will be available at the library.

Confidentiality & Privacy Act. I understand that all records of this study will be kept confidential and that my privacy will be safeguarded. No information will be publicly accessible which could identify me as a participant. I will be identified only as a code number on all research forms/data bases. My name on any signed document will not be paired with my code number in order to protect my identity. I understand that records of my participation will be maintained by NPS for three years, after which they will be destroyed.

Voluntary Nature of the Study. I understand that my participation is strictly voluntary, and if I agree to participate, I am free to withdraw at any time without prejudice.

Points of Contact. I understand that if I have any questions or comments regarding this project upon the completion of my participation, I should contact the Principal Investigator, , Dr. Don Brutzman, 656-2149, brutzman@nps.edu. Any medical questions should be addressed to LTC Eric Morgan, MC, USA, (CO, POM Medical Clinic), (831) 242-7550, eric.morgan@nw.amedd.army.mil. Any other questions or concerns may be addressed to the IRB Chair, LT Brent Olde, 656-3807, baolde@nps.edu.

Statement of Consent. I have been provided with a full explanation of the purpose, procedures, and duration of my participation in this research project. I understand how my identification will be safeguarded and have had all my questions answered. I have been provided a copy of this form for my records and I agree to participate in this study. I understand that by agreeing to participate in this research and signing this form, I do not waive any of my legal rights.

_____   _____

Participant's Signature   Date

_____   _____

Researcher's Signature   Date

APPENDIX L.   STUDENT DEMOGRAPHICS QUESTIONNAIRE

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CA 93943

Transfer of Training Study between Classroom-Based and Computer-Based Training

Questionnaire:

1. Student demographics:

a. What is your rank?

b. What is your rate if applicable?

c. gender

d. age

e. History of assignments:

f. What is your total time in the Navy?

g. Do you have any previous knowledge of ATFP or attended any other ATFP courses?

h. In a scale of 1-5. 1. no knowledge at all 2. little knowledge 3. basic knowledge 4. reasonable knowledge 5.expert knowledge. How do you rate your ATFP knowledge?

i. How often does your command conduct ATFP training?

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APPENDIX M.   SAVAGESTUDIO EXERCISE STUDENT TASK CHECKLIST

SAVAGESTUDIO EXERCISE CHECKLIST

Date: _____   Student #:_____

Training Objectives:
1. Develop and implement Pre-Planned Responses that will be effective mechanisms to detect, deter, defend and mitigate likely terrorist threats against U.S. Navy assets and installations.

Enabling Objectives:

2.3b   Use the SavageStudio visual mode to demonstrate the assessment, warning and threat zones as used in the anti-terrorism program concept of defense in depth. (Knowledge) Performance data for this objective will be collected using the SavageStudio, student will explain or address the 3 zones as they apply to the scenario.

2.3c   Use the SavageStudio in visual mode to demonstrate the application of the Assessment, Warning and Threat Zones as used in the anti-terrorism program. (Skill) Performance data for this objective will be collected using the SavageStudio, student will demonstrate or identify the 3 zones as they apply to the scenario.

2.5a   Use the SavageStudio in visual mode to identify critical assets, and vulnerabilities for the NAVSTA scenario. (Knowledge) Performance data for this objective will be collected using the SavageStudio, describe and explain the assessment of the environment and situation, the student will explain potential threats and vulnerabilities as they apply to the scenario.

2.5b,   Use the SavageStudio in visual mode to explain the anti-terrorism environment and situation; using the X3D visual scene of the generated scenario explain the force protection employment of assets to protect given critical assets while minimizing vulnerabilities. (Skill) Performance data for this objective will be collected using the SavageStudio, the student will identify potential threats and vulnerabilities as they apply to the scenario.

Task 2	SAT	UNSAT
Set up Defense in Depth for the NAVSTA Scenario	N/A	N/A
Assessment zone established or addressed?		
Warning zone established or addressed?		
Threat zone established or addressed?		
List the pre-planned responses for boat-born IED.		
Asses the environment and situation	N/A	N/A
Identify critical assets		
Identify vulnerabilities		
Exercise scenario to describe the principles of defense in depth as they occur in the scenario.		
Observe the pre-planned responses for boat-born IED.		

APPENDIX N.   ANALYST REPORT

A.   ANALYST REPORT INTERFACE

The following figures illustrate the Viskit interface used for creating the analyst report. A brief description is provided for each figure.

　　　　1. The Heading Panel is used to annotate the report information. Information required is title of the report, author's name, date, time and classification of the report.
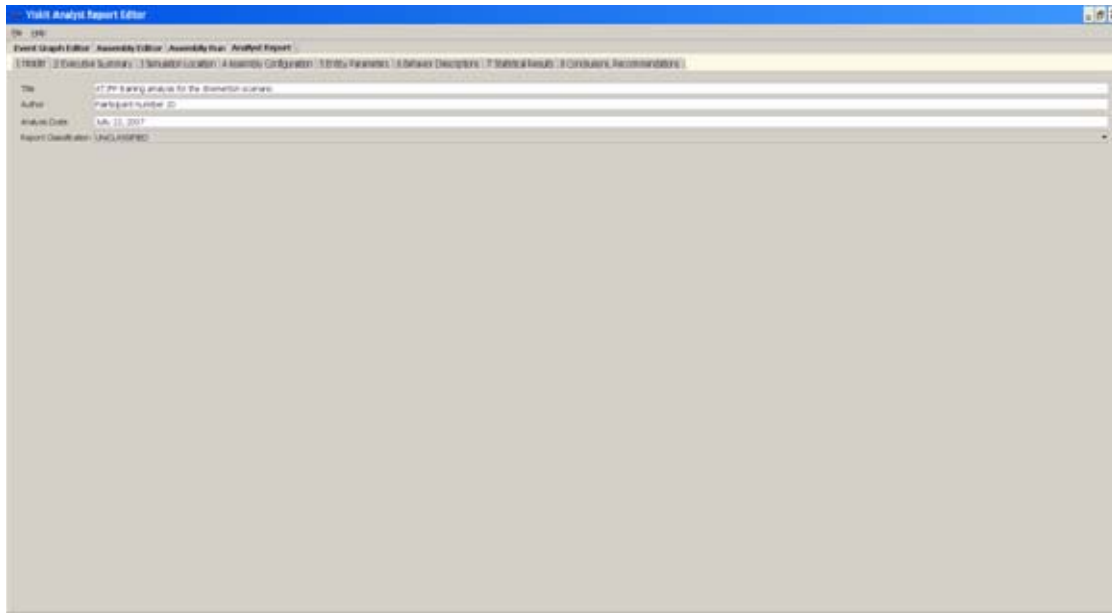
Figure 38.　　　Viskit Analyst Report Editor displaying the Heading Panel window.

2. The Executive Summary allows the analyst to provide a synopsis of the simulation. It provides the context for the remainder of the report and ensures that someone reading the report has an overview of the entire simulation problem
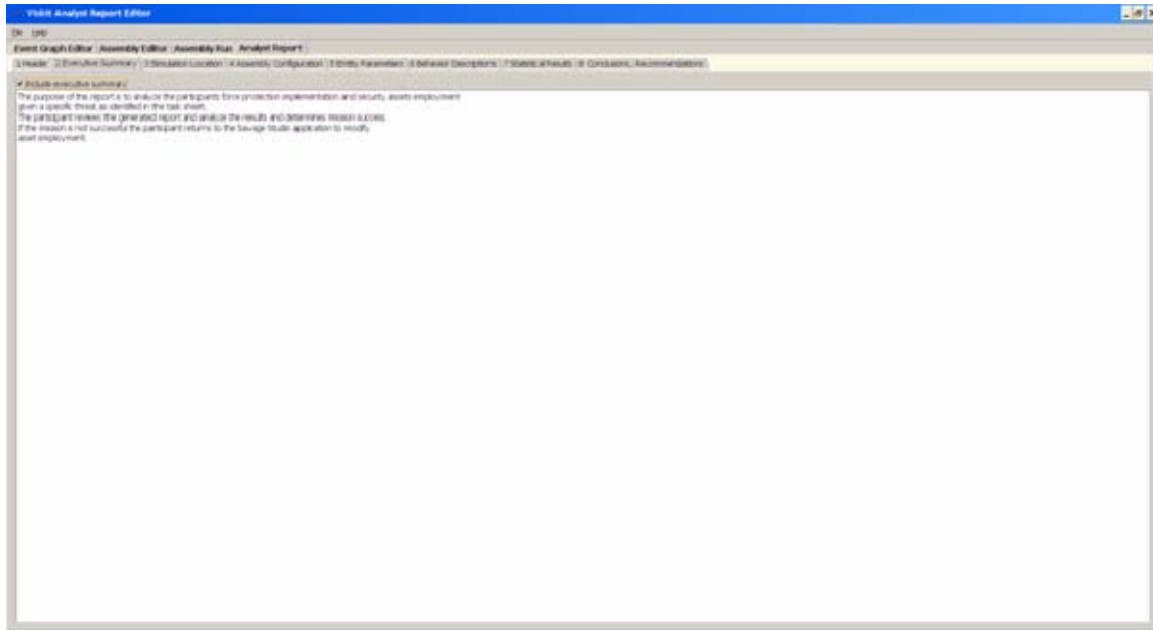
Figure 39.   SavageStudio scenario generation display window depicting scenario loading from the scenario run library.

3. Simulation Location Panel is used to provide information about the simulation environment. The comments in this section allow before and after simulation comparisons from the analyst point of view.

Figure 40.   SavageStudio scenario generation display window depicting scenario loading from the scenario run library.

4. The Simulation Configuration panel is used to enumerate all of the entities and objects employed in the simulation. A table of SimEntities is auto-generated from the assembly output file which lists the description of the entity as well as the name of the event graph that defines its behavior.

Figure 41.   SavageStudio scenario generation display window depicting scenario loading from the scenario run library.

5. The Entity Parameters panel allows the analyst to make annotations about the parameters used in the simulation. The panel provides the ability to preview the parameters that will be incorporated into the simulation. Analysts are required to point out parameters that were used to influence the outcome of the simulation.

Figure 42.   SavageStudio scenario generation display window depicting scenario loading from the scenario run library.

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6. The Behavior Definitions panel allows before and after annotations regarding the level of detail about behavior definition descriptions. The Analysts are required to provide a description about the behaviors used in the simulation.
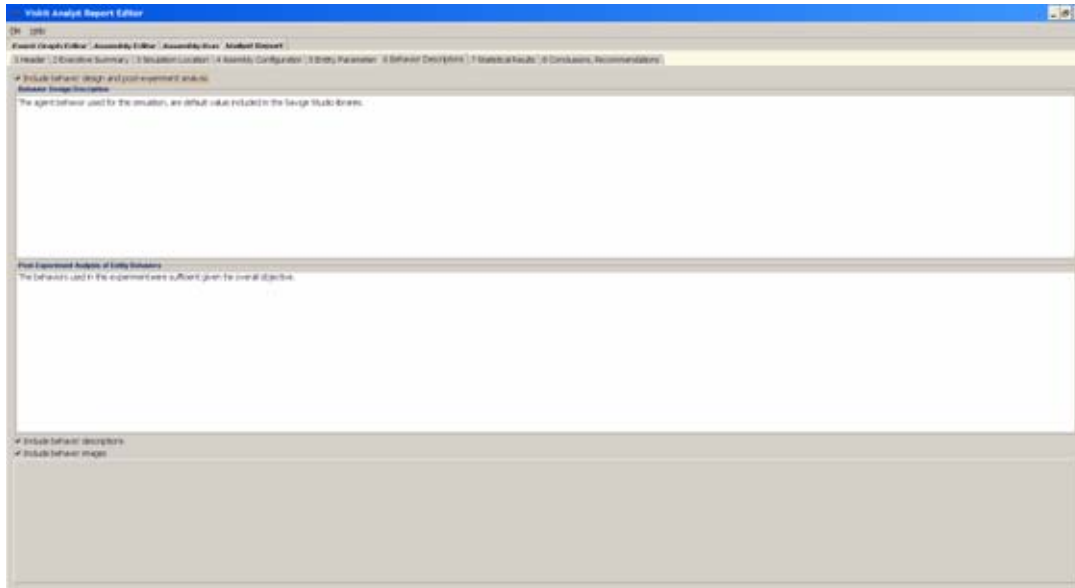
Figure 43.   SavageStudio scenario generation display window depicting scenario loading from the scenario run library.

7. The Statistical Results panel allows a user to provide before and after comments about the replication and summary statistics for a specific simulation. The analyst has the option whether or not he will like to include histogram charts of the replication statistics as part of their output.
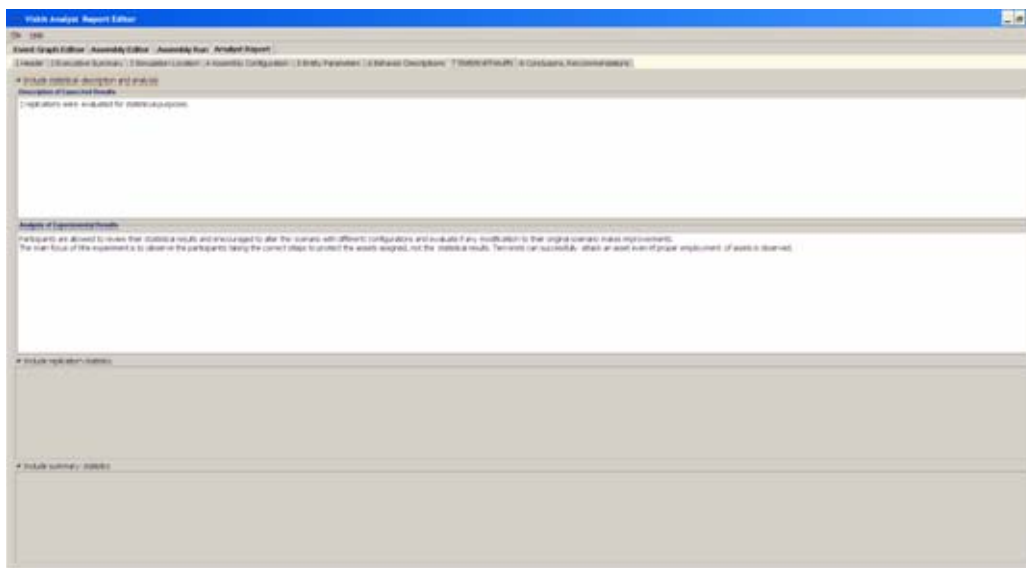
Figure 44.   SavageStudio scenario generation display window depicting scenario loading from the scenario run library.

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8. The Conclusions and recommendations panel allows the analysts to use the interface to provide comments regarding the results of the simulation and recommendations for future work.
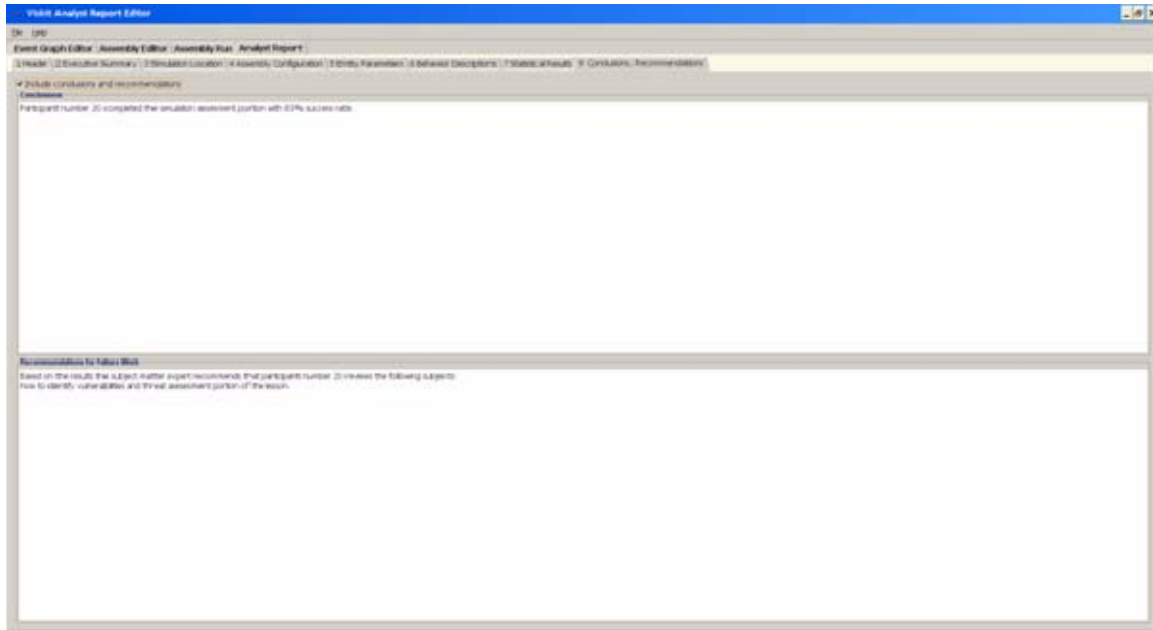
Figure 45.   SavageStudio scenario generation display window depicting scenario loading from the scenario run library.

AT/FP training analysis for the Bremerton scenario

Analyst: **Participant number 20**
Analysis date: **7/22/07 1:21 PM 3/19/07 2:17 PM**

Executive Summary
The purpose of this report is to analyze the participants force protection implementation and security assets employment given a specific threat as identified in the task sheet. The participant reviews the generated report and analyze the results and determines mission success. If the mission is not successful the participant returns to the SavageStudio application to modify asset employment.

Simulation Location
Description of Location Features. The scenario generated by this simulation will be of Bremerton Harbor by participant number 20.

Post-Experiment Analysis of Significant Location Features. Participant number 20 completed 83% of training objectives. He did not properly assess the port vulnerabilities.
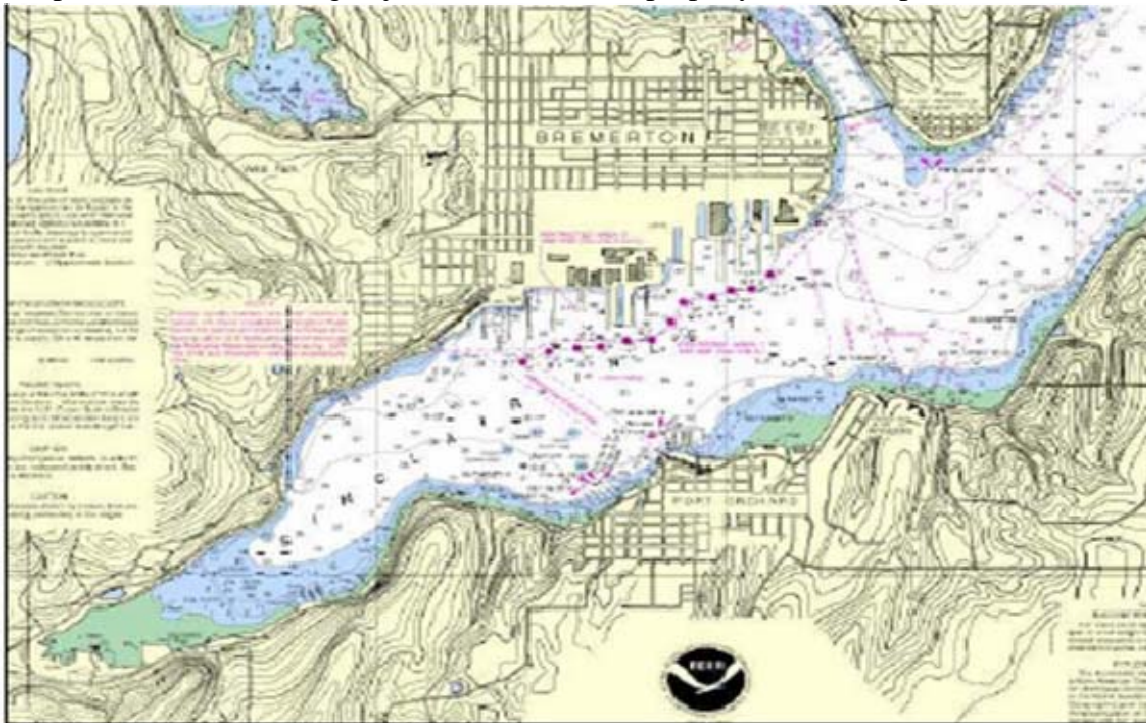
Bremerton Washington location.

Assembly Configuration for Viskit Simulation

Assembly Design Considerations. Assets used by the participant included: 1 Nimitz Carrier, 2 explosive-laden vessels, 2 Rhib patrol boats and Barriers

Post-Experiment Analysis of Simulation Assembly Design. Barrier employment and patrol areas assignment affect the explosive-laden vessels attack profile.

Simulation Entities

Entity Name	Behavior Definition
PierBravo	Obstacles.Pier
PierCharlie	Obstacles.Pier
PierDelta	Obstacles.Pier
MooringE	Obstacles.Pier
MooringF	Obstacles.Pier
MooringG	Obstacles.Pier
MooringBuoyA13	Obstacles.Buoy
MooringBuoyA12	Obstacles.Buoy
MorringBuoyA11	Obstacles.Buoy
MooringBuoyL1	Obstacles.Buoy
MooringBuoyL2	Obstacles.Buoy
MooringBuoyL3	Obstacles.Buoy
MooringBuoyL4	Obstacles.Buoy

TerroristCellPlanner	Hostile.TerroristCellPlanner
Terrorist1	Hostile.ExplosiveLadenVessel
Terrorist2	Hostile.ExplosiveLadenVessel
CVN70	Friendly.MilitaryShip
PierBravo	Obstacles.Pier
PierCharlie	Obstacles.Pier
PierDelta	Obstacles.Pier
MooringE	Obstacles.Pier
MooringF	Obstacles.Pier
MooringG	Obstacles.Pier
RHIB	Friendly.MilitaryPatrolCraft
NauticalChart	Utilities.NauticalChart
MooringBuoyA13	Obstacles.Buoy
MooringBuoyA12	Obstacles.Buoy
MorringBuoyA11	Obstacles.Buoy
MooringBuoyL1	Obstacles.Buoy
MooringBuoyL2	Obstacles.Buoy
MooringBuoyL3	Obstacles.Buoy
MooringBuoyL4	Obstacles.Buoy

Entity Parameters
Entity Parameters Overview. Entity parameters are initialization values used to define new event graphs. These values are pulled directly from the assembly.

Behavior Definitions
Description of Behavior Design. The following table specifies the specific parameters for entities and objects in this simulation.

Post-Experiment Analysis of Entity Behaviors. The following table specifies the specific parameters for entities and objects in this simulation.

Statistical Results
Description of Expected Results. 2 replications were evaluated for statistical purposes.

Analysis of Experimental Results. <u>Comments</u> Participants are allowed to review their statistical results and encouraged to alter the scenario with different configurations and

evaluate if any modification to their original scenario makes improvements. The main focus of the experiment is to observe the participants taking the correct steps to protect the assets assigned, not the statistical results. Terrorists can successfully attack an asset even if proper employment of assets is observed.

As an exemplar, no analysis was performed. Other potential useful statistics would be time to detect all targets or the amount of detections per target.

Replication Report
Entity: Rhib
Property: Rhib2Detections
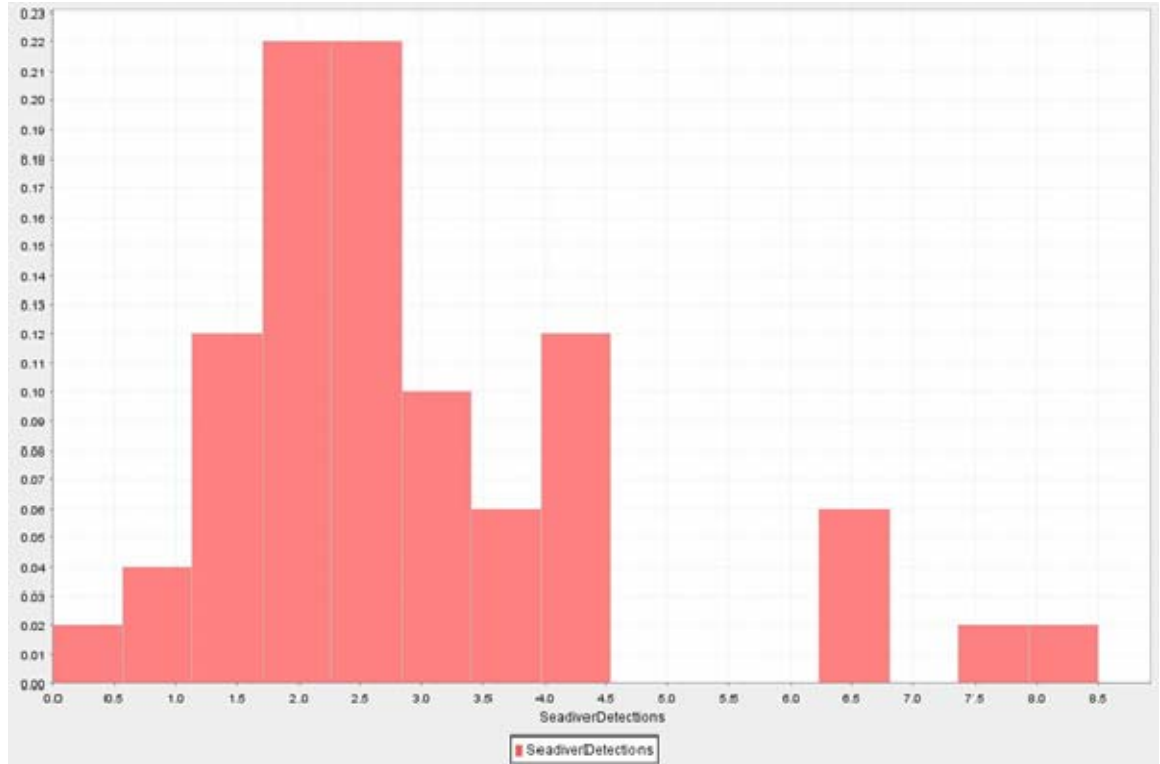
Run#	Count	Min	Max	Mean	StdDev	Variance
1	14.000	0.000	13.000	6.500	4.183	17.500
2	4.000	0.000	3.000	1.500	1.291	1.667
3	10.000	0.000	9.000	4.500	3.028	9.167
4	6.000	0.000	5.000	2.500	1.871	3.500
5	6.000	0.000	5.000	2.500	1.871	3.500
6	4.000	0.000	3.000	1.500	1.291	1.667
7	5.000	0.000	4.000	2.000	1.581	2.500
8	8.000	0.000	7.000	3.500	2.449	6.000
9	4.000	0.000	3.000	1.500	1.291	1.667
10	5.000	0.000	4.000	2.000	1.581	2.500
11	4.000	0.000	3.000	1.500	1.291	1.667
12	4.000	0.000	3.000	1.500	1.291	1.667
13	14.000	0.000	13.000	6.500	4.183	17.500
14	7.000	0.000	6.000	3.000	2.160	4.667

15	6.000	0.000	5.000	2.500	1.871	3.500
16	16.000	0.000	15.000	7.500	4.761	22.667
17	3.000	0.000	2.000	1.000	1.000	1.000
18	5.000	0.000	4.000	2.000	1.581	2.500
19	5.000	0.000	4.000	2.000	1.581	2.500
20	9.000	0.000	8.000	4.000	2.739	7.500
21	18.000	0.000	17.000	8.500	5.339	28.500
22	5.000	0.000	4.000	2.000	1.581	2.500
23	8.000	0.000	7.000	3.500	2.449	6.000
24	6.000	0.000	5.000	2.500	1.871	3.500
25	5.000	0.000	4.000	2.000	1.581	2.500
26	4.000	0.000	3.000	1.500	1.291	1.667
27	5.000	0.000	4.000	2.000	1.581	2.500
28	5.000	0.000	4.000	2.000	1.581	2.500
29	10.000	0.000	9.000	4.500	3.028	9.167
30	1.000	0.000	0.000	0.000	0.000	0.000
31	6.000	0.000	5.000	2.500	1.871	3.500
32	6.000	0.000	5.000	2.500	1.871	3.500
33	7.000	0.000	6.000	3.000	2.160	4.667
34	7.000	0.000	6.000	3.000	2.160	4.667
35	6.000	0.000	5.000	2.500	1.871	3.500
36	9.000	0.000	8.000	4.000	2.739	7.500
37	5.000	0.000	4.000	2.000	1.581	2.500
38	6.000	0.000	5.000	2.500	1.871	3.500
39	9.000	0.000	8.000	4.000	2.739	7.500
40	7.000	0.000	6.000	3.000	2.160	4.667
41	3.000	0.000	2.000	1.000	1.000	1.000
42	6.000	0.000	5.000	2.500	1.871	3.500
43	7.000	0.000	6.000	3.000	2.160	4.667
44	6.000	0.000	5.000	2.500	1.871	3.500
45	5.000	0.000	4.000	2.000	1.581	2.500
46	5.000	0.000	4.000	2.000	1.581	2.500
47	8.000	0.000	7.000	3.500	2.449	6.000
48	6.000	0.000	5.000	2.500	1.871	3.500

49	9.000	0.000	8.000	4.000	2.739	7.500
50	14.000	0.000	13.000	6.500	4.183	17.500

Replication Report
Entity: Rhib
Property: Rhib2Detections
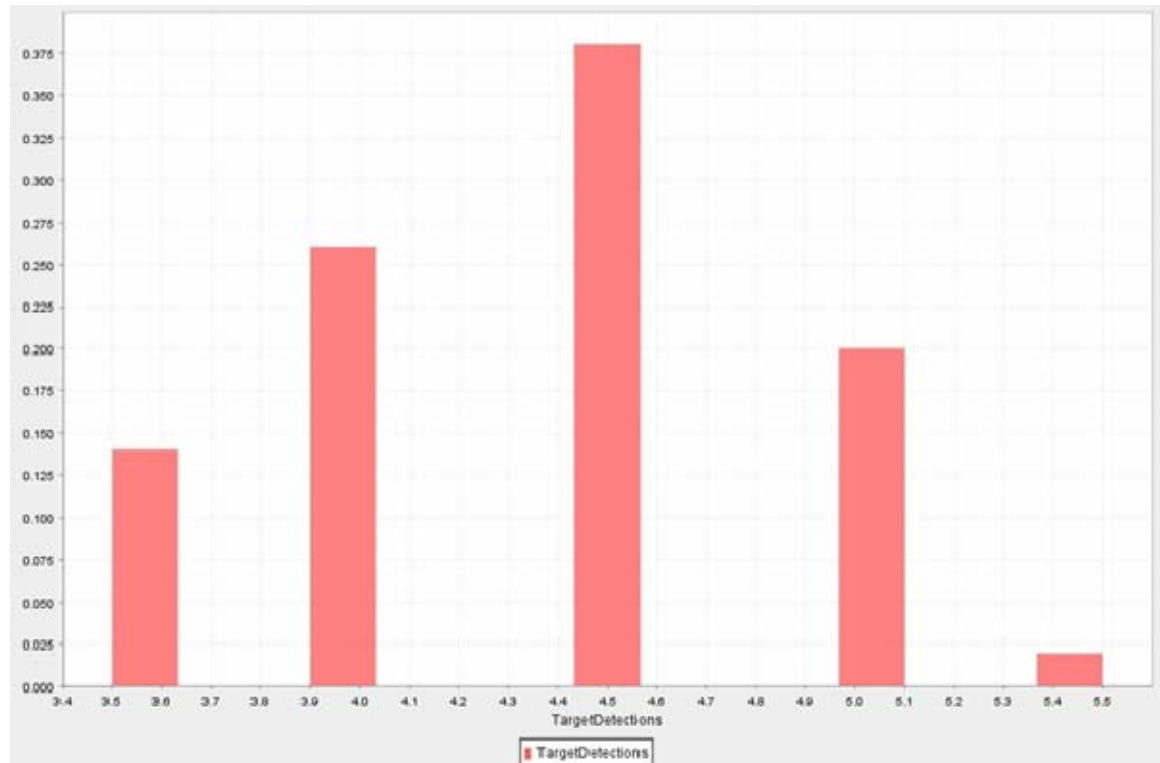
Run#	Count	Min	Max	Mean	StdDev	Variance
1	10.000	0.000	9.000	4.500	3.028	9.167
2	12.000	0.000	11.000	5.500	3.606	13.000
3	11.000	0.000	10.000	5.000	3.317	11.000
4	9.000	0.000	8.000	4.000	2.739	7.500
5	8.000	0.000	7.000	3.500	2.449	6.000
6	11.000	0.000	10.000	5.000	3.317	11.000
7	10.000	0.000	9.000	4.500	3.028	9.167
8	11.000	0.000	10.000	5.000	3.317	11.000
9	9.000	0.000	8.000	4.000	2.739	7.500
10	8.000	0.000	7.000	3.500	2.449	6.000
11	9.000	0.000	8.000	4.000	2.739	7.500
12	10.000	0.000	9.000	4.500	3.028	9.167

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13	10.000	0.000	9.000	4.500	3.028	9.167
14	10.000	0.000	9.000	4.500	3.028	9.167
15	11.000	0.000	10.000	5.000	3.317	11.000
16	10.000	0.000	9.000	4.500	3.028	9.167
17	9.000	0.000	8.000	4.000	2.739	7.500
18	11.000	0.000	10.000	5.000	3.317	11.000
19	9.000	0.000	8.000	4.000	2.739	7.500
20	10.000	0.000	9.000	4.500	3.028	9.167
21	10.000	0.000	9.000	4.500	3.028	9.167
22	10.000	0.000	9.000	4.500	3.028	9.167
23	9.000	0.000	8.000	4.000	2.739	7.500
24	10.000	0.000	9.000	4.500	3.028	9.167
25	10.000	0.000	9.000	4.500	3.028	9.167
26	9.000	0.000	8.000	4.000	2.739	7.500
27	8.000	0.000	7.000	3.500	2.449	6.000
28	8.000	0.000	7.000	3.500	2.449	6.000
29	11.000	0.000	10.000	5.000	3.317	11.000
30	10.000	0.000	9.000	4.500	3.028	9.167
31	11.000	0.000	10.000	5.000	3.317	11.000
32	10.000	0.000	9.000	4.500	3.028	9.167
33	10.000	0.000	9.000	4.500	3.028	9.167
34	9.000	0.000	8.000	4.000	2.739	7.500
35	9.000	0.000	8.000	4.000	2.739	7.500
36	11.000	0.000	10.000	5.000	3.317	11.000
37	10.000	0.000	9.000	4.500	3.028	9.167
38	8.000	0.000	7.000	3.500	2.449	6.000
39	10.000	0.000	9.000	4.500	3.028	9.167
40	10.000	0.000	9.000	4.500	3.028	9.167
41	10.000	0.000	9.000	4.500	3.028	9.167
42	11.000	0.000	10.000	5.000	3.317	11.000
43	9.000	0.000	8.000	4.000	2.739	7.500
44	8.000	0.000	7.000	3.500	2.449	6.000
45	10.000	0.000	9.000	4.500	3.028	9.167
46	11.000	0.000	10.000	5.000	3.317	11.000

47	9.000	0.000	8.000	4.000	2.739	7.500
48	9.000	0.000	8.000	4.000	2.739	7.500
49	9.000	0.000	8.000	4.000	2.739	7.500
50	8.000	0.000	7.000	3.500	2.449	6.000

Summary Report

Entity	Property	Count	Min	Max	Mean	StdDev	Variance
Rhib	Rhib1Detections	2.000	0.000	1.000	0.500	0.707	0.500
Rhib	Rhib2Detections	2.000	0.000	11.294	5.647	7.986	63.782

Conclusions and Recommendations

Conclusions. Participant number 20 completed the simulation assessment portion with 83% success rate.

Recommendations for Future Work. Based on the results the subject matter expert recommends that participant number 20 reviews the following subjects: how to identify vulnerabilities and threat assessment portion of the lesson.

This report was autogenerated by Viskit modeling tool using the Simkit discrete-event simulation (DES) libraries, online at https://diana.nps.edu/Simkit

APPENDIX O.   SUPPORTING MATERIALS

A.   AT/FP LESSON DVD CONTENTS

The AT/FP lesson DVD is organized as follows:

CBT_And_Simulation lesson folder

> Data folder
>
> Narration folder
>
> Player folder
>
> Lesson player

CBT_VS_CI lesson folder

> Data folder
>
> Narration folder
>
> Player folder
>
> Lesson player

B.   AT/FP LESSON DVD REQUESTS

The DVD that contains the CBT lessons created for this thesis can be requested via mail from the Savage Research Group.

Naval Postgraduate School, MOVES Institute, Monterey, California.

Terry Norbraten or Don Brutzman

1 University Circle, Monterey Ca. 93943.

e-mail requests can be made to:

Terry Norbraten tdnorbra@nps.edu

Don Brutzman Brutzman@nps.edu

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    Norfolk, Virginia

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    Great Lakes, Michigan

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    United States Naval Academy
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    University of Iowa
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